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SHIP-SHORE RADIO DIVISION - TRANSMITTER SECTION

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RADIO TRANSMITTER - MODEL T200FK39 - CAPTURED GERMAN SUBMARINE TRANSMITTER

By C. L. Spencer and
Bert Fisk

- Report R-2911 -

UNCLASSIFIED

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Approved by:

R. B. Meyer - Head, Transmitter Section

L. A. Gebhard, Superintendent
Ship-Shore Radio Division

Commodore H.A. Schade, USN,
Director, Naval Research Laboratory

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ABSTRACT

The T200FK39 is a captured German submarine communications transmitter, capable of delivering 200 watts output on frequencies of 3000 to 24,000 kilocycles. Investigation and analysis of the mechanical and electrical performance and construction features were made, with the intention of finding any new or unusual characteristics. Particular attention was paid to the master oscillator circuit, which was found to be of unique design, and to perform exceptionally well in spite of the fact that it is not temperature controlled. The tuning system is also worthy of note in that an optical projection system is used which gives exceptional bandspread and makes accurate tuning quite si ple. The circuits of the first intermediate power amplifier and second intermediate power amplifier with its output limiter were also found to include interesting and desirable features. The transmitter was apparently designed to be used by unskilled personnel because of the simplicity of tuning and the unit replacement feature which would require little technical knowledge.

STATEMENT OF PROBLEM

1. The German T200FK39 submarine transmitter was investigated and tested for:

(a) Overall characteristics of the equipment as compared to U.S. Navy equipment.

(b) Any unusual or noteworthy design features that might be of interest to future equipment designers.

GENERAL DESCRIPTION OF EQUIPMENT

2. The T200FK39 German submarine transmitter is rated at two hundred watts power output on CW, or 50 watts MCW or phone and covers the frequency range of 3000 to 24,000 kilocycles. The dimensions and weights of the transmitter as a whole and of the component units are given in Table 1. It is so designed that it may be operated from either local or remote positions.

3. The main transmitter is made up of four separate units plugged into a case, each being independently removable for replacement or servicing. Access from the front, only, is necessary in ordinary usage.

4. It is a four-stage transmitter employing master oscillator, first intermediate power amplifier, second intermediate power amplifier, and final power amplifier. The master oscillator is of the push-pull type, using two temperature-compensated triode REN - 904 tubes and covers the frequencies from 3000 to 6000 kilocycles in four ranges.

5. The first intermediate power amplifier is a push-push circuit using two REN-904 triode tubes. On bands one to four, one tube is biased well beyond cut-off so that the other tube can operate as a straight-through class C amplifier, and the biased tube functions only as a neutralizing capacitor. On bands five to twelve the stage operates as a push-push doubler.

6. The second intermediate power amplifier uses one RL12/P50 screen-grid type tube which operates as a buffer on bands one through eight and as a doubler on bands nine through twelve. A unique feature in the form of an output limiter is coupled to the plate of this stage. This consists of an RL12/P50 tube connected as a biased-diode output limiter as shown in Figure 2.

7. The final amplifier uses an RS-383 screen-grid type tube and operates straight through on all bands. For A-2 and A-3 emission the suppressor grid is biased negative and modulated.

8. The antenna loading circuit is coupled to the power amplifier by means of a tapped variable condenser. The circuit consists of a continuously variable, sliding contact, loading coil and a group of fixed condensers that can be switched in series or parallel with the coil to accomplish proper antenna matching on all frequencies. An instantaneous-indicating in-

ductance-capacitance rectifying meter is used to indicate relative RF output.

9. Biasing voltages for the entire transmitter are obtained from a full-wave dry-disc rectifier. Particular regulated values of fixed bias are obtained from a voltage divider network employing a STV-280/80 multi-element gaseous regulator tube. A two-ampere, twenty-four volt direct-current supply for operation of relays and automatic follow-up tuning is also supplied by a dry-disc rectifier.

10. With the key up, all tubes in the RF section are biased beyond cut off. Keying is accomplished by a high speed relay which in the closed position removes the fixed bias from the master oscillator and first intermediate power amplifier.

11. The modulator is a conventional class A audio amplifier using three RV12-P2000 pentode tubes with triode connections, in parallel, transformer coupled to the suppressor grid of the final tube. The audio oscillator employs a variable inductance transformer in a conventional circuit and has a continuously adjustable frequency range from 500 to 1300 cycles.

TESTS AND RESULTS

12. Master Oscillator

(a) Mechanical Construction:

(1) The entire oscillator framework is made of ceramic material, copper plated on the inside. Two ceramic copper-plated sides make the frame a completely enclosed and shielded case as illustrated in Plates 16 and 18.

(2) The oscillator inductance is of tubular ceramic, internal silver plated ridges forming the coil. The inductance of this coil is varied by a rotatable ceramic ball that is plated with three silver rings. The arrangement of these rings is such that the inductance of the coil is varied so as to produce approximately linear tuning as the ball is turned.

(3) The leads from the plate connections on the tube sockets to the tuning coil are copper plated pieces of ceramic.

(4) The fixed condensers that are switched across the coil to give band changing, and all other condensers in the oscillator circuit that might affect the frequency stability are of ceramic construction.

(5) The tuning balls for both the oscillator and first intermediate frequency amplifier, and the optical tuning dial are all mounted on a single ceramic shaft so there is no possibility of backlash in that part of the tuning mechanism.

(6) The oscillator tubes, as shown in Plate 38, are temperature compensated by means of an extra element mounted close to the plate of the tube to compensate for capacity change due to expansion of the plate.

(7) Radio-frequency choke coil forms and mounting terminals and

brackets are all of ceramic material.

(8) All component parts are rigidly mounted so that vibration and shock will have little effect upon frequency calibration. This oscillator is not temperature controlled but apparently every attempt was made to make its operating frequency as free of temperature drift as possible.

(b) Electrical Design. (See Figure 1)

(1) This oscillator is of the push-pull type with the plates connected to the ends of the center-tapped coil. The grids are driven from taps on a condenser bridge which is connected across the coil.

(c) Frequency Drift During Locked-Key Operation for Two Hours.

(1) At 3000 kilocycles the frequency of this oscillator dropped 88 cycles or 0.0029 per cent during the first five minutes and 109 cycles or 0.0036 per cent in the next hour and fifty-five minutes. (Table 3). As a comparison at the same frequency, the XTCK transmitter changed 30 cycles or 0.001 per cent and 130 cycles or 0.0043 per cent in the next hour and fifty-five minutes. The specification limits as set down for the XTCK are 0.004 per cent for the first five minutes and 0.004 per cent for the remainder of the run. (Reference Table 47; Model XTCK; NRL Report No. 2007).

(2) At 5500 kilocycles the frequency of the oscillator dropped 380 cycles or 0.069 per cent during the first five minutes and 350 cycles or 0.0063 per cent during the remainder of the run. In comparison at 6000 kilocycles, the XTCK transmitter changed 0.00125 per cent during the first five minutes and 0.00125 per cent during the remainder of the run. The XTCK specifications are the same in each case.

(d) Frequency drift during two-hour locked-key operation using 6J5 tubes in the oscillator in place of REN-904 is shown in Tables 5 and 6.

(1) At 3000 kilocycles the frequency changed 110 cycles or 0.0037 per cent during the first five minutes and 80 cycles or 0.0027 per cent during the remainder of the run, as against 0.0029 per cent and 0.0036 per cent when using the German tubes.

(2) At 5500 kilocycles the frequency changed 490 cycles or 0.0089 per cent during the first five minutes and 390 cycles or 0.0071 per cent for the remainder of the run as against 0.0069 and 0.0063 per cent when using the German tubes.

(e) The results of change of frequency due to variation of supply voltages is shown in Table 11.

(1) When the 400 volt DC and 280 volt AC supplies were simultaneously varied from minus to plus 10 per cent in one minute, the frequency changed 0.0015 per cent at 3000 cilocycles and 0.001 per cent at 5500 kilocycles. When the variation took place over a period of five minutes the frequency changed 0.0013 per cent at 3000 kilocycles and 0.0018 at 5500 kilocycles. As a comparison, the model XTCK transmitter under the same test had a frequency change of 0.00315 per cent at 8000 kilocycles for one minute

and 0.00385 per cent at 9000 kilocycles for five minutes. (Table 15; Model XTCK; NRL report No. 2007).

(f) Tables 12 and 13 and Plates 42 and 43 give the results of tests involving variation of ambient temperature. These were taken at 3000 and 5500 kilocycles which represent the low and high frequency ends of the oscillator. The T200FK39 oscillator gave results as follows at 3000 kilocycles: From 50 to 40 degrees centigrade, 0.00027 per cent change in frequency per one degree centigrade; from 40 to 30 degrees centigrade, 0.00009 per cent; from 30 to 20 degrees centigrade, 0.00027 per cent; from 20 to 10 degrees centigrade, 0.00025 per cent; from 10 to 0 degrees centigrade, 0.0001 per cent. For comparison, the XTCK transmitter gave the following results at 2000 kilocycles; From 50 to 40 degrees centigrade, 0.00027 per cent change in frequency per one degree centigrade; from 40 to 30 degrees centigrade, 0.00013 per cent; from 30 to 20 degrees centigrade, 0.00011 per cent; from 20 to 10 degrees centigrade, 0.00006 per cent, and from 10 to 0 degrees centigrade, 0.00024 per cent.

(1) The specification limit for the XTCK is 0.0005 per cent. The T200FK39 transmitter stayed well under this limit in all instances.

(2) Table 14 gives the results of the same test at 5500 kilocycles using 6J5 tubes in the oscillator and shows some improvement over the tests with German type tubes.

(g) Frequency deviations with variations in relative humidity are shown in Table 15 and Plate 45. Tests were made at 5500 kilocycles and the maximum frequency change was 235 cycles or 0.0043 per cent, as compared to a change of 0.0223 per cent at 4500 kilocycles for a similar test on the XTCK transmitter. (Table 45: XTCK transmitter; NRL report No. 2007). The specification limit for the XTCK is 0.02 per cent change in frequency.

(h) The results of the test for change from continuously keyed condition to intermittently keyed condition are shown in Table 16. The change in frequency was 0.0017 per cent for this transmitter operating at 6000 kilocycles as against a percentage of 0.0051 for the XTCK at 9000 kilocycles. (Table 57; XTCK Transmitter; NRL report No. 2007).

(i) No quantitative test could be made on the T200FK39 transmitter relative to frequency variation due to vibration, because there is no dial lock on the master tuning control and when the transmitter is subjected to jar or vibration, the tuning dial moves off its proper setting by an unpredictable amount. A simple locking device would have, however, remedied this situation.

(j) Change from key locked to intermittently keyed condition is shown in Table 18. At 5500 kilocycles the frequency change was 0.0134 per cent, as compared with the XTCK at 4500 kilocycles with a frequency change of 0.002 per cent, and 0.0129 per cent at 18000 kilocycles. (Table 56; XTCK transmitter; NRL report No. 2007).

13. Calibrated Tuning System

(a) The design of this system is one of the outstanding features of the transmitter. It consists of a rough mechanical scale on the front panel, and a highly accurate optical system that projects the expanded band readings on a ground glass screen on the front panel. (See Plates 19, 20 and 21). The optical element bearing the calibration markings consists of a glass plate attached directly to the ceramic shaft on which the rotors that tune the master oscillator and first intermediate power amplifier are mounted. The twelve band scales are accurately printed on this glass plate photographically and are magnified about twenty diameters through a system of lenses and prisms, so that the total scale length for the longest band is 150 inches. This highly magnified and stretched tuning scale permits the use of calibration marks at each kilocycle, spaced far enough apart so that accurate estimates to one tenth of a kilocycle are possible at all frequencies. All band scales are direct reading and no interpolation is necessary. The band switch tilts a pivoted prism so that only the correct band scale will be projected on the screen at any one time.

(b) There is no back lash in the calibration and dial system so that reset accuracy is not affected by whether the calibration marks are approached from above or below. The accuracy of reset to previously calibrated frequencies is shown in Table 8. The best reset accuracy was shown on band two with an average frequency deviation of 0.00003 per cent, and the poorest on bands nine and ten with an average deviation each of 0.00025 per cent, and the poorest average was 0.0025 per cent (Table 21; XTCK Transmitter; NRL report No. 2007).

(c) The dial setting of the T200FK39 is calibrated at only one frequency which is in band twelve at approximately 22000 kilocycles, depending upon the exact frequency of the crystal oscillator used for calibration. Tests for frequency calibration accuracy were made on both models a and c on the calibrating frequency standards and at the low and high ends of each band, as shown in Tables 9 and 10. For the model a transmitter the frequency standard was found to have a deviation of 0.0016 per cent at the beginning of the test and 0.0032 at the end of the test. The transmitter was calibrated against its own frequency standard. The smallest deviation in frequency was at the high end of band twelve, with a deviation of 0.0014 per cent. The maximum deviation occurred at the low end of band six with 0.0217 per cent deviation. This is shown in Table 9.

(1) For the model c transmitter the frequency deviation of the frequency standard was 0.0068 per cent at the beginning and 0.0034 per cent at the end of the test. The minimum deviation was found on band four with 0 per cent deviation at both ends. The maximum deviation found was at the high end of band one with 0.0098 per cent. This is shown complete in Table 10.

(2) The specification limit for the XTCK transmitter is 0.02 per cent. The model a transmitter exceeded this limit at only three test points and then only by a very small amount, while the model c transmitter was within the specification limit at all test frequencies.

(3) These tests were made with the aid of an LD frequency meter that had been brought into zero beat with WWV.

14. First Intermediate Power Amplifier

(a) Mechanical Design:

(1) The first intermediate power amplifier (IPA) is completely enclosed in a metal case with the exception of the tubes. It is mounted immediately in front of the oscillator compartment and is gang tuned with it.

(2) The tuning inductance is a ceramic tube with internal copper plated ridges forming the coil. The stage is tuned by means of a copper slug inside the coil that is attached to the same ceramic shaft that controls the oscillator and optical micrometer tuning indicator. This slug is in the form of three rings cut from a copper ball, and gives the type of tuning that is necessary to track with the oscillator.

(3) Band changing is accomplished by switching eight sets of fixed silver-plated ceramic trimmer condensers across the tuning inductance.

(4) A single pole switch is operated by the band change control in such a way that high negative bias is applied to the grid of one tube on bands one through four.

(b) Electrical Circuit:

(1) This stage employs two tubes with their grids connected in push-pull and their plates in parallel, giving doubler action in normal operation. On bands one to four, one tube is biased well beyond cut off so that straight-through neutralized operation is accomplished. This design permits changing the type of operation without disturbing the tracking of the ganged circuits. See diagram number 1.

(c) The power output of this stage remains relatively constant as indicated by the grid current drawn by the second intermediate power amplifier at representative low and high frequencies as shown in Table 2. Also the power output is apparently about the same when doubling as on straight-through operation.

15. <u>Second Intermediate Power Amplifier and Output Limiter</u>

(a) Design

(1) This stage employs a single pentode tube as buffer or doubler, and a single diode-connected pentode of the same type as an output voltage limiter. The tank circuit of this stage is identical with that of the final amplifier and is gang tuned with it. All stages in the transmitter are direct coupled so that there is a minimum number of tuning controls.

(2) The output limiter has its cathode connected to ground. All other elements are tied together, supplied with a regulated negative voltage of 140 volts through an RF choke coil, and is coupled to the plate of the second intermediate amplifier by means of a condenser. This device serves to limit the positive RF output peaks of the buffer from over-driving the grid of the final.

(b) The output limiter imposes a rather large, constant load on the second intermediate amplifier stage and consequently the stage tunes very broadly. Also the input to the following stage remains quite constant over the full range of the transmitter, as is illustrated in Table 2.

16. Final Power Amplifier

(a) Design:

(1) This stage uses a single pentode tube and operates straight through on all frequencies. Its tank circuit is identical to that of the previous stage and is gang tuned with it. The previous stage tunes so broadly, due to output limiting, that no trouble is experienced in the tracking of the two stages.

(2) The tuning inductances for this and the previous stage are of the sliding contact, continuously variable type. The tank capacitors are of the flat, plated ceramic type and more or less capacity is switched in or out of the circuit by the band switch control. Coupling to the antenna tuning unit is through a stacked, tapped condenser that gives variable amounts of output coupling.

(3) The stage is modulated by biasing the suppressor grid of the final tube to minus 140 volts and applying the modulating audio signal to it.

(b) The power output and efficiency of the final stage increase as the frequency of operation is raised - the lowest output and efficiency occurring at the lowest frequency tested and the highest output and efficiency at 12500 and 16000 kilocycles as shown in Table 7.

(c) The power input and output of this transmitter remained relatively constant during variation of ambient temperature as shown in Tables 12, 13 and 14.

(d) Variation of relative humidity had no effect upon power input or output as shown in Table 15.

17. Automatic Follow-up Tuning

(a) Design

(1) With the exception of the three antenna tuning controls, there are only two tuning controls and a band-change switch to tune the complete transmitter. The master tuning control sets the frequency of the oscillator and tracks the first intermediate power amplifier with it. The second tuning control adjusts the inductance of the second intermediate power amplifier and final tank coils. The second tuning control can be motor driven so that the last two stages are automatically tuned to the approximate frequency indicated by the master tuning dial. This is accomplished by means of a flat cam wheel with two machined steps on the side of it that operates a motor control swtich. The position of this wheel is determined by the band switch and the master tuning control.

The motor control switch is mounted so that it can move up and down across the wheel and its position is determined by the setting of the final tuning control. If the motor control switch is on the lowest surface of the wheel, the motor runs in a direction such as to move the tuning and the switch to the middle level surface on the wheel, and when the motor switch arrives on this step the motor is stopped. If the motor control switch is on the highest level, the motor rotates in the opposite direction until the middle level on the wheel is reached. The characteristic of the follow-up tuning is determined entirely by the cutting of the control cam wheel. For photographs of this see Plates 13 and 15.

(b) This device does not tune accurately to the indicated frequency but only puts the second tuning control in the vicinity of the correct setting - not close enough for operation without additional tuning by the operator. However, it does decrease the time necessary for resetting the transmitter and it eliminates the possibility of the operator tuning up on an incorrect frequency.

(c) Model a, which is an early model of the transmitter, is equipped with automatic follow-up tuning, but the model c does not have this feature.

18. Antenna Tuning Meter

(a) Design:

(1) This is a rectifying inductance-capacitance coupled type of instrument that gives instantaneous readings of relative RF output. Its readings cannot be calibrated in terms of amperes and therefore it cannot be used as a measure of absolute power output, but it is an excellent instrument to use in tuning up for maximum output because there is no lag in indication. The installation of this device is shown in Plate 10.

19. Over-all Construction

(a) Light metal alloys of about ninty-five percent magnesium and five percent aluminum, as indicated by a spectral analysis, were used for all frame construction and for side and cover plates, except unit Z - the base terminal unit - which is made of steel. Many of the screws used in the equipment are also made of light alloy of about ninty percent aluminum and ten percent magnesium.

(b) The oscillator-first intermediate power amplifier unit is of excellent construction and would be rugged enough to endure extensive shock and vibration without incurring damage; however, the remainder of the transmitter is built to much less exacting standards. Condensers and resistors in general are mounted so that they vibrate readily on their pigtails and mounting leads. Some of the transformers are mounted on light metal brackets that crack and break very easily. No one unit of the equipment received at the Laboratory for test was in working order when received and all had to have repairs made before they could be used.

(c) Insulating and terminal strips are made of varnished composition material that is highly inflammable and of generally poor quality. However, it gave no trouble during humidity tests.

(d) A test panel on which all grid, plate, and screen grid currents and voltages of the RF tubes may be read is located on the front panel for convenience in servicing.

CONCLUSIONS AND RECOMMENDATIONS

20. Size, Accessibility, and Power Output

(a) The overall size and space requirements are quite small as compared to equipment of similar power output of typical Navy design. The fact that everything is accessible from the front further reduces the space requirements and allows this transmitter to set tight against other equipment. This is an important point in present day equipment design because of the limited space available aboard ships.

(b) The three lower units are easily removable by the operation of lever type releases, while the top unit is held in place by only a single cap-screw. A design employing removable units, such as in this transmitter, greatly facilitates servicing, especially when spare units are carried so that immediate replacement may be made and the defective unit repaired without interrupting communications. This would seem to be a very desirable feature as against the majority of present equipments in which the failure of any small part necessitates the closing down of the equipment until repairs are effected.

21. Frequency Characteristics

(a) The oscillator and the optical tuning systems are the most outstanding features of the T200FK39. The oscillator is built up largely of ceramic materials, apparently to achieve satisfactory frequency stability without the use of a temperature controlled oven. The favorable comparison that this transmitter makes with the XTCK attests to the success of the design principles involved. The ceramic type of construction seems to be the main factor in its success, since the circuit employed is quite conventional.

(b) The optical tuning system seems to be superior to anything currently in use in any U.S. Navy transmitters. This optical system has the advantage over the Veder-Root counters used un the XTCK in that the tuning device does not need to be accurately linear, since the scale is printed on a glass plate tuning dial and then tremendously enlarged by projection. The direct reading of transmitter frequency from the tuning dial without any possibility of mistake is also an important advantage for this system, especially for inexperienced personnel.

(c) The main disadvantages of this tuning system would be the expense and technical difficulties encountered in manufacture.

22. The automatic follow-up tuning device does not accomplish the same results as gang tuning in the XTCK. About all that can be said for it is that it facilitates tuning up the transmitter and that it will prevent the operator from tuning the final stages to the wrong frequencies. The system was abandoned in the later models either because of lack of

necessary materials or because it did not prove to be worth the added expense.

23. With the exception of the oscillator unit, the construction practices employed in this equipment would fail to pass specifications for U. S. Navy ship-borne equipment.

24. Generally this transmitter has been designed to get maximum power from a minimum space; reliability in operation by having replaceable units; and as nearly fool-proof operation as possible through a simplified and direct reading tuning system.

25. The data for this report is recorded on pages 70 to 122 in NRL Registered Notebook No. 5786.

TABLE 1

MODEL T200FK39a TRANSMITTING EQUIPMENT

List of Weights and Dimensions

Transmitter Unit Complete

Height	54 in.
Width	10-1/2 in.
Depth	19 in.
Weight	400 lbs.

Unit "K"		Unit "J"		Unit "F"	
Height	21 in.	Height	11-3/4 in.	Height	10-1/4 in.
Depth	19 in.	Width	10-1/2 in.	Width	10-1/2 in.
Width	10-1/2 in.	Depth	17-1/2 in.	Depth	17-1/2 in.
Weight	144 lbs	Weight	72 lbs	Weight	49 lbs

Unit "Y"		Unit "A"	
Height	10 in.	Height	10-1/2 in.
Width	10-1/2 in.	Width	3-1/2 in.
Depth	15 in.	Depth	4 in.
Weight	32 lbs	Weight	5 lbs.

TABLE 2

MODEL T200FK39a TRANSMITTING EQUIPMENT

Operating Voltages and Currents as Obtained from Test Panel

Xmtr Band	One		Six		Nine		Twelve	
Freq. Output	3000 KC		7500 KC		12500 KC		24000 KC	
Osc. Freq.	3000 KC		3750 KC		3125 KC		6000 KC	
1st IPA	Amplifier		Doubler		Doubler		Doubler	
2nd IPA	Amplifier		Amplifier		Doubler		Doubler	
	Key up	Key down	Key Up	Key Down	Key Up	Key Down	Key Up	Down
Osc Eg	74	0	75	0	74	0	74	0
Osc Ig	0	4.9	0	4.9	0	3.7	0	6.9
Osc Ip	0	30	0	27	0	27	0	25.5
Osc Ep	295	295	295	270	290	270	290	265
1st IPA Eg	75	0	75	0	74	0	74	0
1st IPA Ig	0.0	2.1	0.5	5.0	0.5	3.7	0.5	6.3
1st IPA Ip	0	13.5	0	25.5	0	24	0	29
1st IPA Ep	215	215	210	195	210	200	210	190
2nd IPA Eg	75	44	74	73	74	58	74	78
2nd IPA Ig	0	0.3	0	2.3	0	1.4	0	2.8
2nd IPA Esg	295	295	295	270	290	270	290	265
2nd IPA Isg	0	7.5	0	6.5	0	4.8	0	5.0
2nd IPA Ep	440	405	440	405	440	410	440	410
2nd IPA Ip	1.4	119	1.0	119	1.0	119	1.0	129
PA Eg	84	140	84	150	84	120	84	120
PA IG	0	31	0	35	0	19	0	19

TABLE 2 (Contd)

MODEL T200FK39a TRANSMITTING EQUIPMENT

Operating Voltages and Currents as Obtained from Test Panel

PA Esg	420	290	415	250	440	320	440	340
PA Isg	0	84	0	87	0	86	0	77
PA Ep	1350	1525	1350	1525	1350	1525	1350	1525
PA Ip	0	285	0	285	0	290	0	290
Limiter E	160	170	160	170	155	157	155	157

TABLE 3

MODEL T200FK39a TRANSMITTING EQUIPMENT

LOCKED-KEY OPERATION FOR TWO HOURS - 3000 KC - BAND 1

Time	Frequency (KC)	Frequency Change (KC)
1300	3000.243	0
1305	3000.155	0.088
1310	3000.110	0.133
1315	3000.095	0.148
1320	3000.089	0.154
1325	3000.085	0.158
1330	3000.084	0.159
1345	3000.082	0.161
1400	3000.082	0.161
1415	3000.076	0.167
1430	3000.070	0.173
1445	3000.063	0.180
1500	3000.060	0.187

Change in frequency during first five minutes:
88 cycles or 0.0029 per cent.
Change in frequency during remainder of run:
109 cycles or 0.0036 per cent.

TABLE 4

MODEL T200FK39a TRANSMITTING EQUIPMENT

Locked-Key Operation for Two Hours - 5500 KC - Band 4

Time	Frequency (KC)	Frequency Change (KC)
1300	5501.050	0
1305	5500.670	0.380
1310	5500.580	0.470
1315	5500.550	0.500
1330	5500.430	0.620
1345	5500.390	0.670
1400	5500.380	0.680
1415	5500.370	0.690
1430	5500.360	0.700
1445	5500.340	0.720
1500	5500.330	0.730

Change of frequency during first 5 minutes:
380 cycles or 0.0069 per cent.
Change of frequency during remainder of run:
350 cycles or 0.0063 per cent.

TABLE 5

MODEL T200FK39a TRANSMITTING EQUIPMENT

Locked-Key Operation for Two Hours - 3000 KC - Band 1
6J5 Tubes Used in the Oscillator

Time	Frequency (KC)	Frequency Change (KC)
0845	3000.820	0
0850	3000.710	0.110
0855	3000.670	0.150
0900	3000.660	0.160
0915	3000.650	0.170
0930	3000.640	0.180
0945	3000.640	0.180
1000	3000.640	0.180
1015	3000.640	0.180
1030	3000.630	0.190
1045	3000.630	0.190

Change of frequency during first 5 minutes:
110 cycles or 0.0037 per cent
Change of frequency during remainder of run:
80 cycles or 0.0027 per cent.

TABLE 6

MODEL T200FK39a TRANSMITTING EQUIPMENT

Locked-Key Operation for Two Hours - 5500 KC - Band 4
6J5 Tubes Used in the Oscillator

Time	Frequency (KC)	Frequency Change (KC)
1300	5500.880	0
1305	5500.390	0.490
1310	5500.195	0.685
1315	5500.130	0.750
1320	5500.100	0.780
1325	5500.080	0.800
1330	5500.060	0.820
1345	5500.045	0.835
1400	5500.045	0.835
1415	5500.020	0.860
1430	5500.017	0.863
1445	5500.000	0.880
1500	5500.000	0.880

Change of frequency during first 5 minutes:
490 cycles or 0.0089 per cent.
Change of frequency during remainder of run:
390 cycles or 0.0071 per cent

TABLE 7

MODEL T200FK39a TRANSMITTING EQUIPMENT

Determination of CW Power Output

Frequency (KC)	PA MA	PA Volts	Input Power	Measured Output Power	Efficiency Per Cent
3,000	300	1500	450	135	30
5,000	300	1500	450	200	45
7,500	300	1500	450	240	54
12,500	300	1500	450	265	59
16,000	280	1500	420	220	54
20,000	300	1500	450	180	40
24,000	300	1500	450	170	38

NOTE: The power output was measured photometrically by means of a lamp load. The lamp was first lighted from the output of the transmitter and then brought up to the same brilliance with measured sixty cycle AC.

TABLE 8

MODEL T200FK39a TRANSMITTING EQUIPMENT

Accuracy of Reset to Previously Calibrated Frequencies

Band	Trial Number	Frequency (KC)	Frequency Deviation Cycles	Frequency Deviation Per Cent
1	Original	3000.560		
	1	3000.565	5	0.00016
	2	3000.560	0	
	3	3000.560	0	
	4	3000.565	5	0.00016
			Average	0,00008
2	Original	4000.690		
	1	4000.690	0	
	2	4000.690	0	
	3	4000.695	5	0.00013
	4	4000.690	0	
			Average	0.00003
3	Original	4500.850		
	1	4500.850	0	
	2	4500.840	10	0.00022
	3	4500.860	10	0.00022
	4	4500.850	0	
			Average	0.00011
4	Original	5500.235		
	1	5500.230	5	0.00009
	2	5500.240	5	0.00009
	3	5500.240	5	0.00009
	4	5500.220	15	0.00027
			Average	0.00013
5	Original	6500.670		
	1	6500.670	0	
	2	6500.670	0	
	3	6500.700	30	0.00046
	4	6500.685	15	0.00023
			Average	0.00017
6	Original	8000.210		
	1	8000.220	10	0.00013
	2	8000.230	20	0.00025
	3	8000.220	10	0,00013
	4	8000.220	10	0.00013
			Average	0.00016

TABLE 8 (Contd)

MODEL T200FK39a TRANSMITTING EQUIPMENT

Accuracy of Reset to Previously Calibrated Frequencies

Band	Trial Number	Frequency (KC)	Frequency Deviation Cycles	Per Cent
7	Original	8500.245		
	1	8500.250	5	0.00006
	2	8500.260	15	0.00018
	3	8500.240	5	0.00006
	4	8500.285	40	0.00047
			Average	0.00019
8	Original	11000.520		
	1	11000.510	10	0.00009
	2	11000.460	60	0.00055
	3	11000.530	10	0.00009
	4	11000.510	10	0.00009
			Average	0.00021
9	Original	13000.770		
	1	13000.760	10	0.00008
	2	13000.700	70	0.00054
	3	13000.750	20	0.00015
	4	13000.740	30	0.00023
			Average	0.00025
10	Original	15002.160		
	1	15002.170	10	0.00007
	2	15002.170	10	0.00007
	3	15002.200	40	0.00026
	4	15002.240	80	0.00055
			Average	0.00025
11	Original	16500.150		
	1	16500.155	5	0.00003
	2	16500.225	75	0.00047
	3	16500.152	2	0.00001
	4	16500.125	25	0.00016
			Average	0.00016

TABLE 9

MODEL T200FK39a TRANSMITTING EQUIPMENT

Test for Frequency Calibration Accuracy

Band	Frequency (KC)	Transmitter Calibration	Deviation	
			Cycles	Per Cent
Calibration Frequency	21911.2	21911.2	350	0.0016
1, Low End	3000.0	2999.7	220	0.0073
1, High End	3400.0	3399.8	200	0.0059
2, Low End	3400.0	3399.8	220	0.0065
2, High End	4100.0	4099.7	320	0.0078
3, Low End	4100.0	4099.7	335	0.0082
3, High End	5000.0	4999.5	550	0.011
4, Low End	5000.0	4999.6	450	0.009
4, High End	5900.0	5899.4	500	0.0085
5, Low End	5900.0	5899.0	1200	0.0203
5, High End	6900.0	6899.0	1125	0.0163
6, Low End	6900.0	6898.5	1500	0.0217
6, High End	8200.0	8199.0	1300	0.0158
7, Low End	8200.0	8199.5	700	0.0085
7, High End	10000.0	9999.2	800	0.008
8, Low End	10000.0	9999.2	750	0.0075
8, High End	12000.0	11999.4	700	0.0058
9, Low End	12000.0	11998.0	2250	0.0187
9, High End	13800.0	13798.0	2125	0.0154
10, Low End	13800.0	13798.0	2800	0.0203
10, High End	16400.0	16398.0	2350	0.0143
11, Low End	16400.0	16399.0	1200	0.0073
11, High End	20000.0	19999.0	1150	0.0058
12, Low End	20000.0	19999.0	1125	0.0056
12, High End	24000.0	23999.9	250	0.0014
Calibration Frequency	21911.2	21911.2	700	0.0032

TABLE 10

MODEL T200FK39c TRANSMITTING EQUIPMENT

Test for Frequency Calibration Accuracy

Band	Frequency (KC)	Transmitter Calibration	Deviation Cycles	Deviation Per Cent
Calibration Frequency	22021.6	22021.6	1500	0.0068
1, Low End	3000.0	2999.7	250	0.0083
1, High End	3400.0	3399.5	335	0.0098
2, Low End	3400.0	3399.8	130	0.0038
2, High End	4100.0	4099.8	230	0.0056
3, Low End	4100.0	4100.2	140	0.0034
3, High End	5000.0	4999.8	93	0.0018
4, Low End	5000.0	5000.0	000	
4, High End	5900.0	5900.0	000	
5, Low End	5900.0	5899.5	550	0.0093
5, High End	6900.0	6899.6	240	0.0035
6, Low End	6900.0	6899.5	310	0.0045
6, High End	8200.0	8199.6	360	0.0044
7, Low End	8200.0	8199.8	125	0.0015
7, High End	10000.0	9999.5	460	0.0046
8, Low End	10000.0	9999.8	100	0.001
8, High End	12000.0	11999.5	310	0.0026
9, Low End	12000.0	11999.5	600	0.005
9, High End	13800.0	13799.6	280	0.002
10, Low End	13800.0	13799.5	380	0.0028
10, High End	16400.0	16399.5	430	0.0026
11, Low End	16400.0	16399.8	90	0.0006
11, High End	20000.0	19999.3	700	0.0035
12, Low End	20000.0	19999.5	260	0.0013
12, High End	24000.0	23999.3	720	0.003
Calibration Frequency	22021.6	22021.6	750	0.0034

TABLE 11

MODEL T200FK39a TRANSMITTING EQUIPMENT

Variation of Supply Voltages

400 Volt Supply	280 Volt Supply	Frequency (KC)	Frequency Change Cycles	Frequency Change Per Cent
		Minus to Plus 10 per cent in One Minute		
360	250	3000.250		
400	280	3000.270		
440	310	3000.270	20	0.0015
360	250	5500.175		
400	280	5500.200		
440	310	5500.230	55	0.001
		Minus to Plus 10 per cent in Five Minutes		
360	250	3000.215		
400	280	3000.230		
440	310	3000.255	35	0.0013
360	250	5500.200		
400	280	5500.250		
440	310	5500.300	100	0.0018

TABLE 12

MODEL T200FK39a TRANSMITTING EQUIPMENT

Variation of Ambient Temperature - 3000 KC

Time	Amb. Temp. (C)	Rel. Hum. (%)	Frequency (KC)	PA IP	Antenna Current (Amps)
0830	50.5	23	3000.340	210	2.0
0845	50.5	23	3000.353	220	2.1
0900	50.0	15	3000.375	210	2.0
0915	50.0	15	3000.382	210	2.0
0930	50.0	15	3000.377	200	2.0
0945	40.0	16	3000.365	200	2.0
1000	40.0	16	3000.345	200	2.0
1015	40.0	16	3000.320	200	2.0
1030	40.0	16	3000.305	200	2.0
1045	40.0	16	3000.297	200	2.0
1100	30.0	15	3000.283	200	2.0
1115	30.0	18	3000.270	200	2.0
1130	30.0	18	3000.267	200	2.0
1145	30.0	18	3000.267	200	2.0
1200	30.0	18	3000.270	200	2.0
1215	20.0	23	3000.275	200	2.05
1230	19.0	21	3000.282	200	2.05
1245	20.0	23	3000.292	200	2.05
1300	20.0	23	3000.310	200	2.05
1315	20.0	18	3000.320	200	2.05
1330	10.0	28	3000.337	200	2.05
1345	10.0	27	3000.350	200	2.05
1400	10.0	27	3000.365	205	2.05
1415	10.0	21	3000.377	210	2.05
1430	10.0	21	3000.395	210	2.05
1445	0.0	--	3000.400	210	2.05
1500	0.0	--	3000.410	210	2.05
1515	0.0	--	3000.420	210	2.05
1530	0.0	--	3000.422	210	2.05
1545	0.0	--	3000.425	210	2.05

Summary

Temperature Change (C)	Cycles Change Per 10 C	Per Cent Change Per 1 C
50 to 40	80	0.00027
40 to 30	27	0.00009
30 to 20	50	0.00017
20 to 10	75	0.00025
10 to 0	30	0.0001

280V, 400V, and 1500V. Supplies were maintained constant throughout the run.

TABLE 13

MODEL T200FK39a TRANSMITTING EQUIPMENT

Variation of Ambient Temperature - 5500 KC

Time	Amb. Temp. (C)	Rel. Hum. (%)	Frequency (KC)	PA Ip (Ma)	Antenna Current (Amps)
0830	50.0	18	5500.180	210	2.1
0845	50.0	23	5500.235	210	2.1
0900	50.0	18	5500.227	205	2.1
0915	50.0	18	5500.237	200	2.0
0930	50.0	13	5500.210	200	2.0
0945	40.0	27	5500.180	200	2.1
1000	40.0	13	5500.157	200	2.1
1015	40.0	13	5500.110	200	2.1
1030	40.0	13	5500.083	200	2.1
1045	40.0	13	5500.042	200	2.1
1100	30.0	14	5500.027	200	2.1
1115	30.0	14	5500.007	200	2.1
1130	30.0	14	5499.990	200	2.1
1145	28.0	18	5499.990	200	2.1
1200	28.0	20	5499.995	200	2.1
1215	18.0	32	5500.005	200	2.1
1230	20.0	23	5500.010	200	2.1
1245	20.0	20	5500.045	200	2.1
1300	20.0	16	5500.075	200	2.1
1315	20.0	16	5500.107	200	2.1
1330	10.0	18	5500.125	200	2.1
1345	10.0	16	5500.165	200	2.1
1400	10.0	16	5500.205	210	2.2
1415	10.0	16	5500.227	210	2.2
1430	10.0	16	5500.260	210	2.2
1445	0.0	--	5500.295	210	2.2
1500	0.0	--	5500.330	210	2.2
1515	0.0	--	5500.375	210	2.2
1530	0.0	--	5500.405	210	2.2
1545	0.0	--	5500.430	210	2.2

Summary

Temperature Change (C)	Cycles Change per 10°C	Per Cent Change Per 1°C
50 to 40	168	0.00031
40 to 30	47	0.00008
30 to 20	112	0.00022
20 to 10	153	0.00028
10 to 0	170	0.00030

280 Volt, 400 Volt, and 1500 Volt supplies maintained constant throughout the run.

TABLE 14

MODEL T200FK39a TRANSMITTING EQUIPMENT

Variation of Ambient Temperature - 5500 KC
6J5 Tubes Replacing REN904s in Oscillator

Time	Amb. Temp. (C)	Rel. Hum. (%)	Frequency (KC)	PA Ip (Ma)	Antenna Current (Amps)
1015	50.0	12	5500.790	210	2.1
1030	50.0	12	5500.710	200	2.0
1045	50.0	18	5500.675	200	2.0
1100	50.0	18	5500.630	200	2.0
1115	42.0	20	5500.570	200	2.05
1130	38.0	33	5500.560	200	2.05
1145	40.0	20	5500.520	200	2.05
1200	40.0	18	5500.520	200	2.05
1215	30.0	21	5500.510	200	2.05
1230	30.0	21	5500.510	200	2.05
1245	30.0	23	5500.510	200	2.05
1300	30.0	23	5500.520	200	2.05
1315	30.0	21	5500.530	200	2.05
1330	20.0	10	5500.550	200	2.05
1345	20.0	10	5500.580	200	2.05
1400	20.0	10	5500.600	200	2.05
1415	20.0	10	5500.630	200	2.05
1430	10.0	16	5500.670	200	2.05
1445	10.0	16	5500.700	200	2.05
1500	10.0	16	5500.740	200	2.05
1515	10.0	16	5500.775	200	2.05
1530	0.0	--	5500.820	210	2.1
1545	0.0	--	5500.860	210	2.1
1600	0.0	--	5500.890	210	2.1
1615	0.0	--	5500.900	210	2.1
1630	0.0	--	5500.905	210	2.1

Summary

Temperature Change (C)	Cycles Change Per 10°C	Per Cent Change Per 1°C
50 to 40	110	0.0002
40 to 30	10	0.00002
30 to 20	100	0.00018
20 to 10	145	0.00026
10 to 0	130	0.00023

280 Volt, 400 Volt, and 1500 Volt supplies maintained constant throughout the

TABLE 15

MODEL T200FK39a TRANSMITTING EQUIPMENT

Variation in Relative Humidity - 5500 KC

Time	Amb. Temp. (C)	Rel. Hum. (%)	Frequency (KC)	PA Ip (Ma)	Antenna Current (Amps)
1300	40.0	16	5499.990	200	2.1
1315	40.0	16	5499.975	200	2.1
1330	40.0	16	5499.968	200	2.1
1345	40.0	16	5499.950	200	2.1
1400	40.0	16	5499.940	200	2.1
1415	40.0	87	5499.800	200	2.1
1430	40.0	90	5499.779	200	2.1
1445	40.0	93	5499.735	200	2.1
1500	40.0	93	5499.715	200	2.1
1515	40.0	93	5499.705	200	2.1
1530	40.0	23	5499.840	200	2.1
1545	40.0	16	5499.875	200	2.1
1600	40.0	16	5499.880	200	2.1
1615	40.0	16	5499.880	200	2.1
1630	40.0	16	5499.880	200	2.1

Frequency at end of first test period: 5499.940 KC
Frequency of greatest subsequent change: 5499.705 KC
Maximum frequency change: 235 cycles or 0.0043 per cent

TABLE 16

MODEL T200FK39a TRANSMITTING EQUIPMENT

Change from Continuously Keyed Condition to Intermittently Keyed Condition

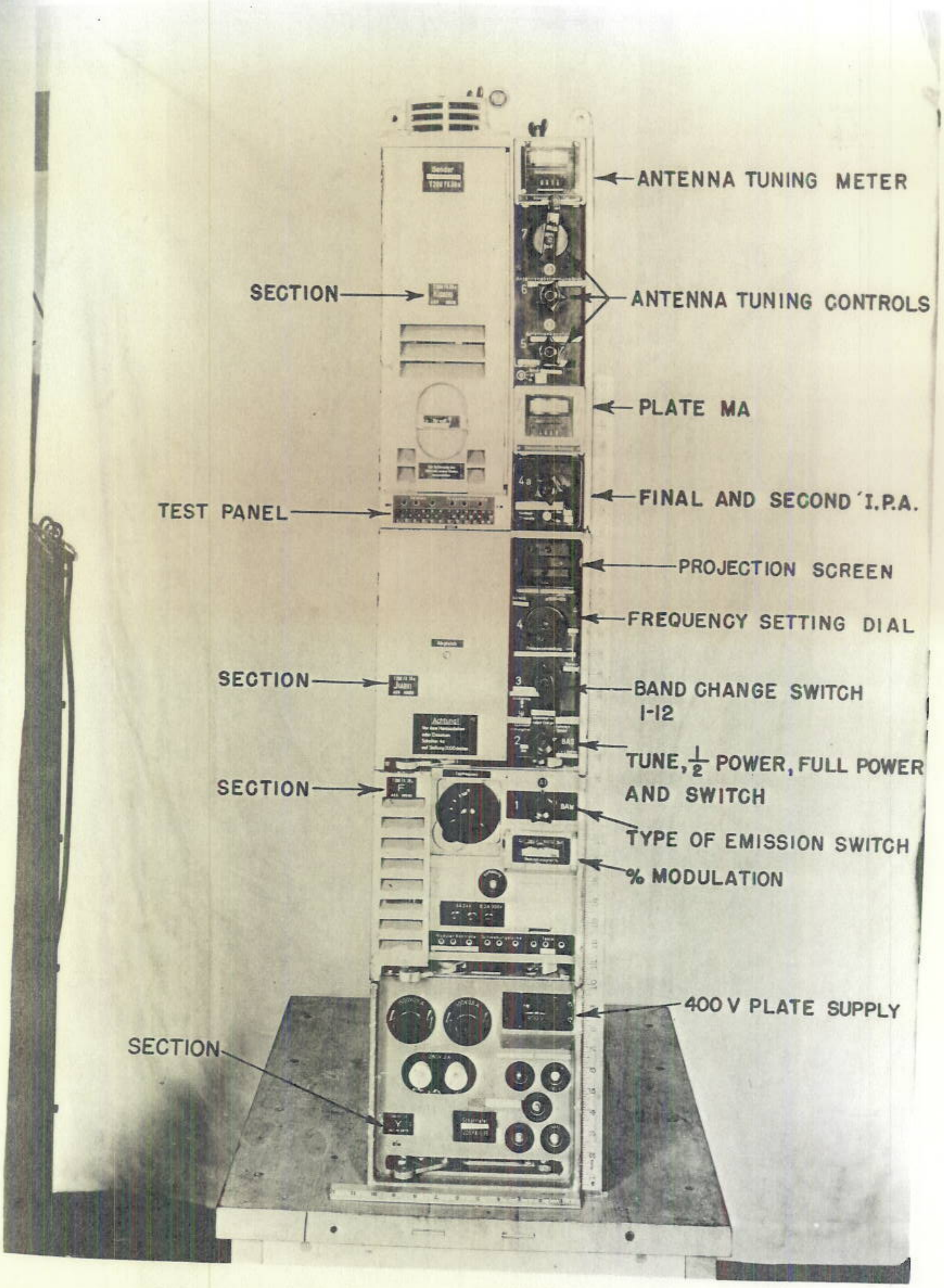
Frequency at End of 30 Minutes Continuous Keying (KC)	Frequency at End of 10-Second Dash after 20-Minute Pause (KC)	Frequency Change	
		Cycles	Per Cent
6000.500	6000.600	100	0.0017

TABLE 17

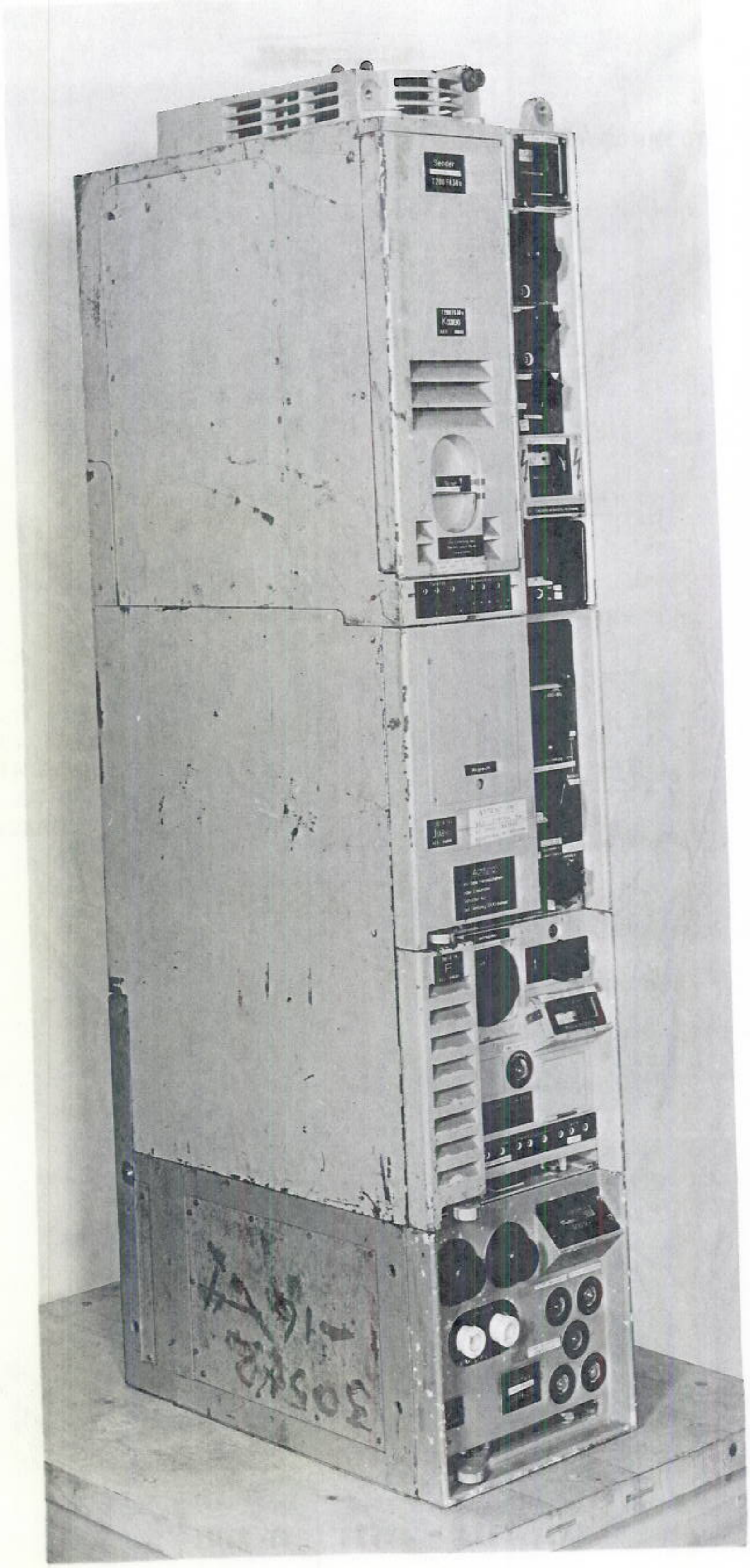
MODEL T200FK39a TRANSMITTING EQUIPMENT

Change from Key Locked to Intermittently Keyed Condition

Frequency at End of 10 Minutes Key-Locked Period (Kc)	Frequency at End of 10-Second Dash 20 minutes later (Kc)	Frequency Change	
		Cycles	Per Cent
5500.000	5500.740	740	0.0134

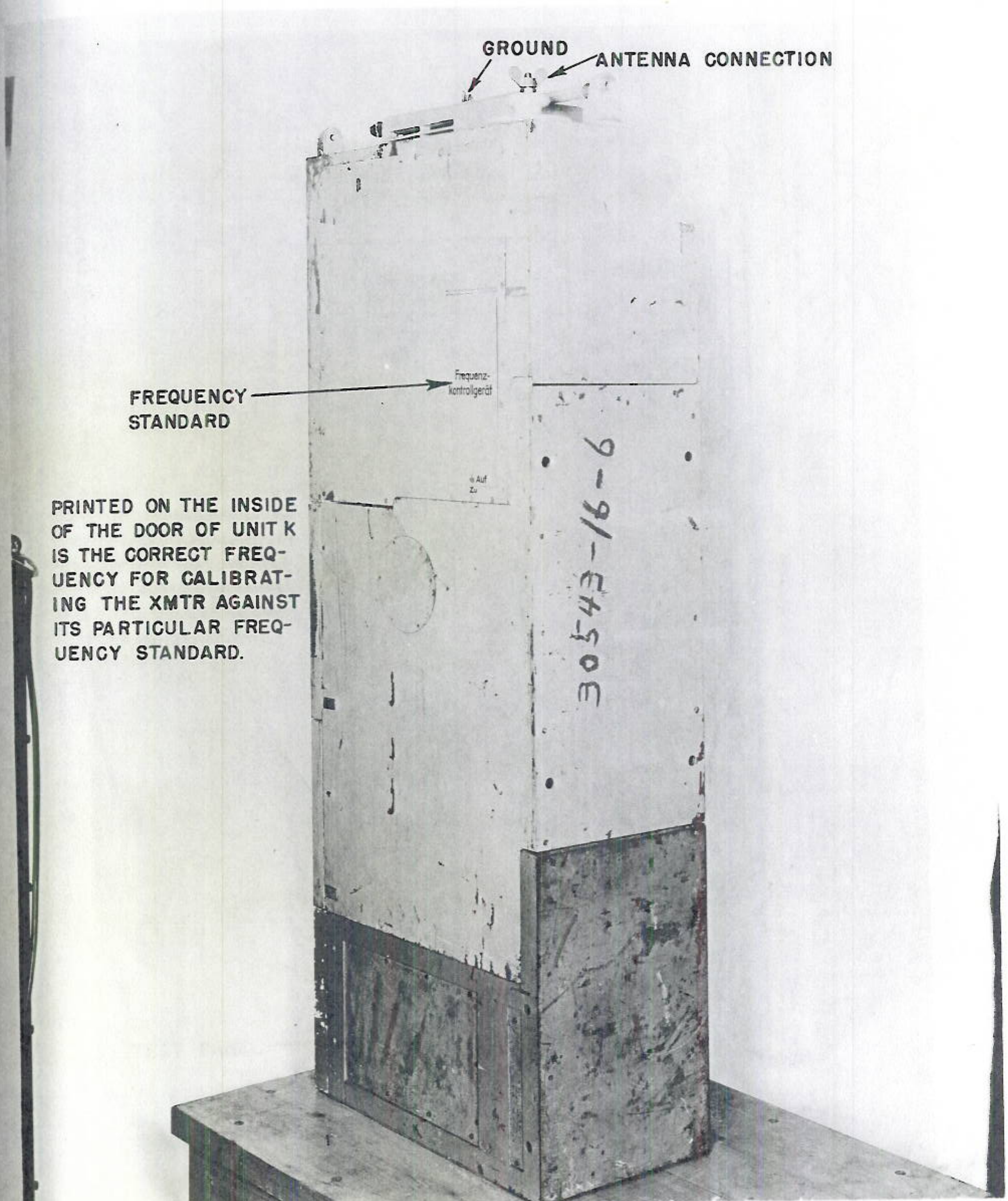


XMTR T200 FK39a - FRONT.

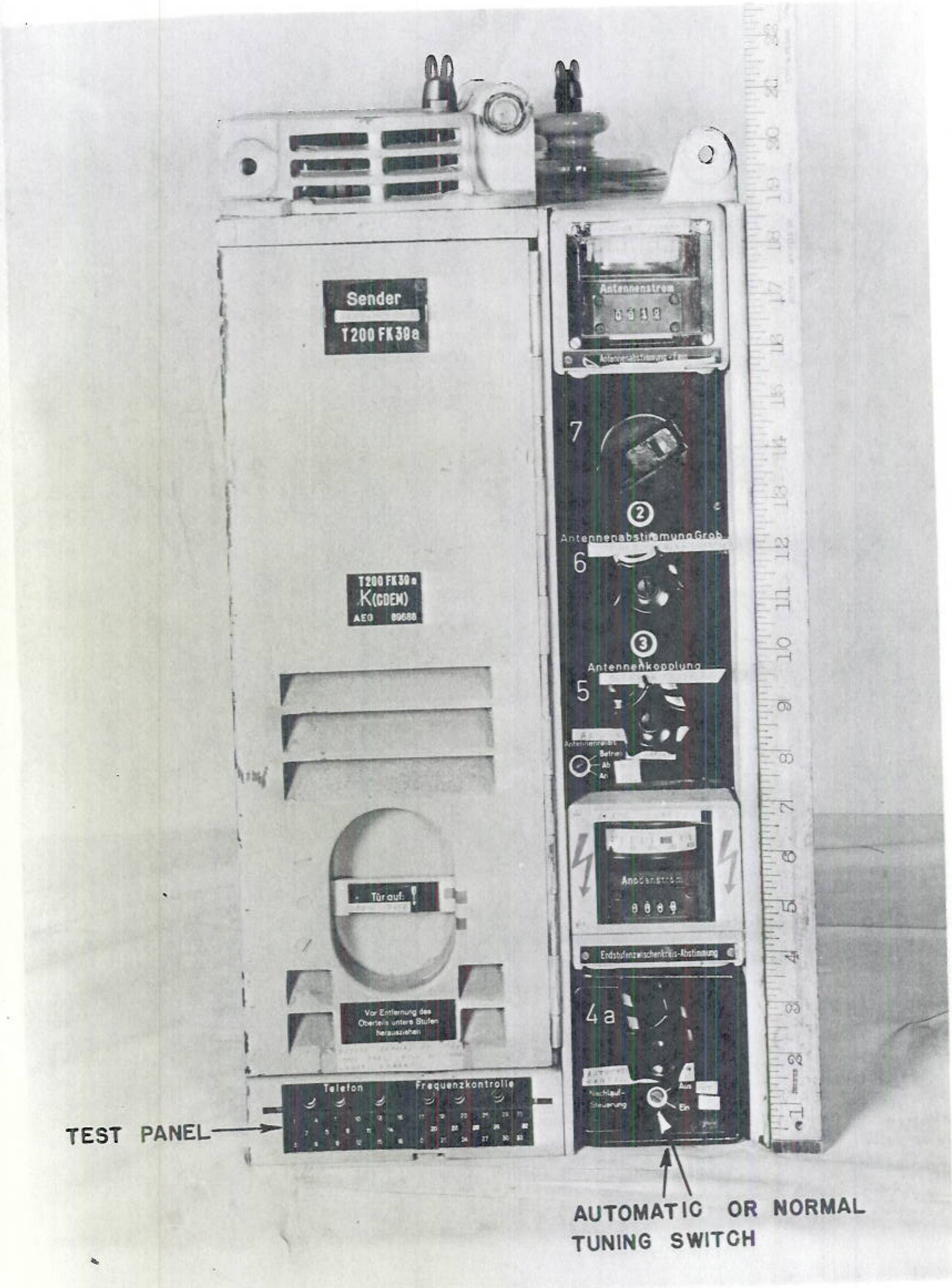


XMTR T200 FK39a - LEFT FRONT.

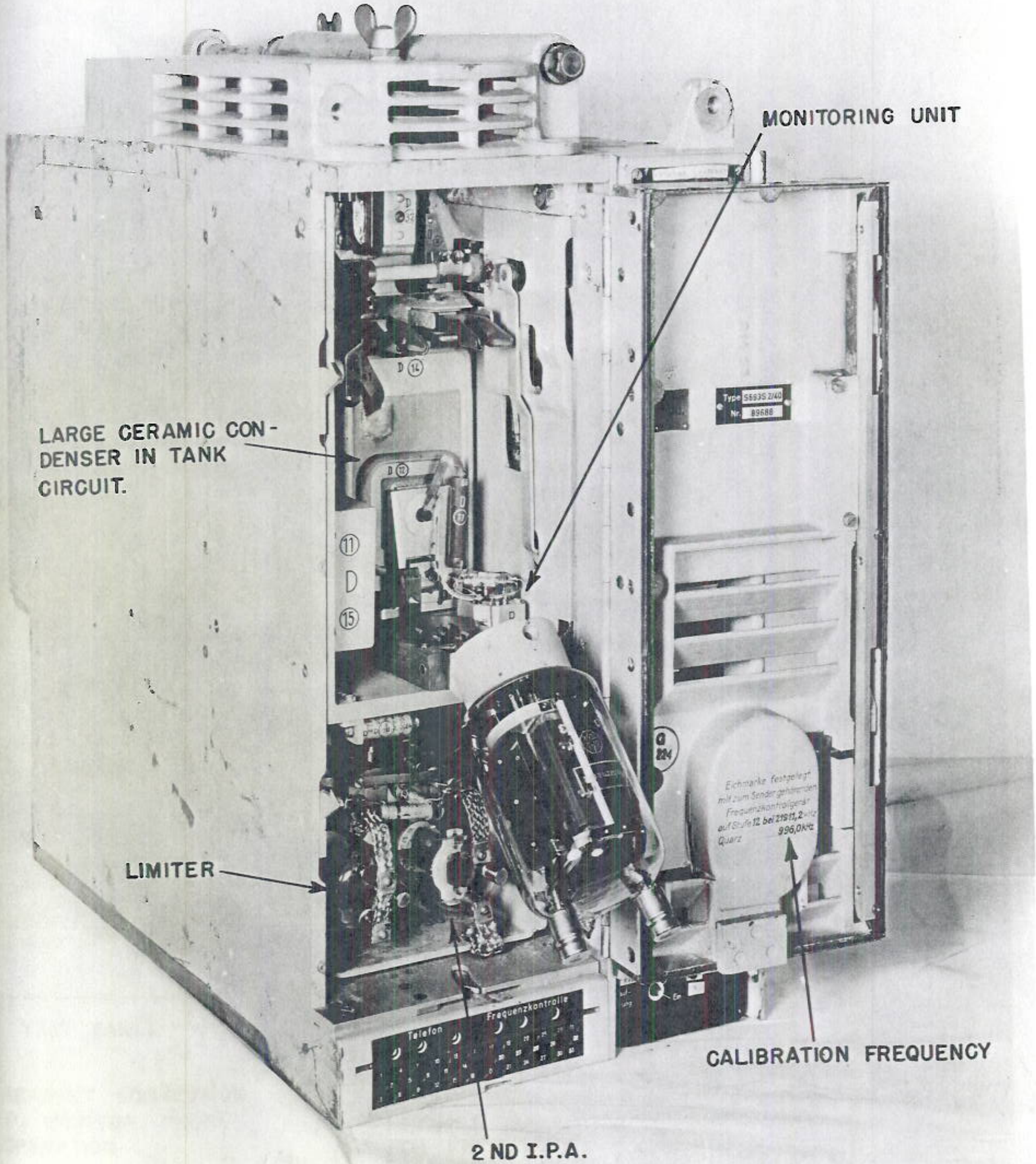
PLATE 2



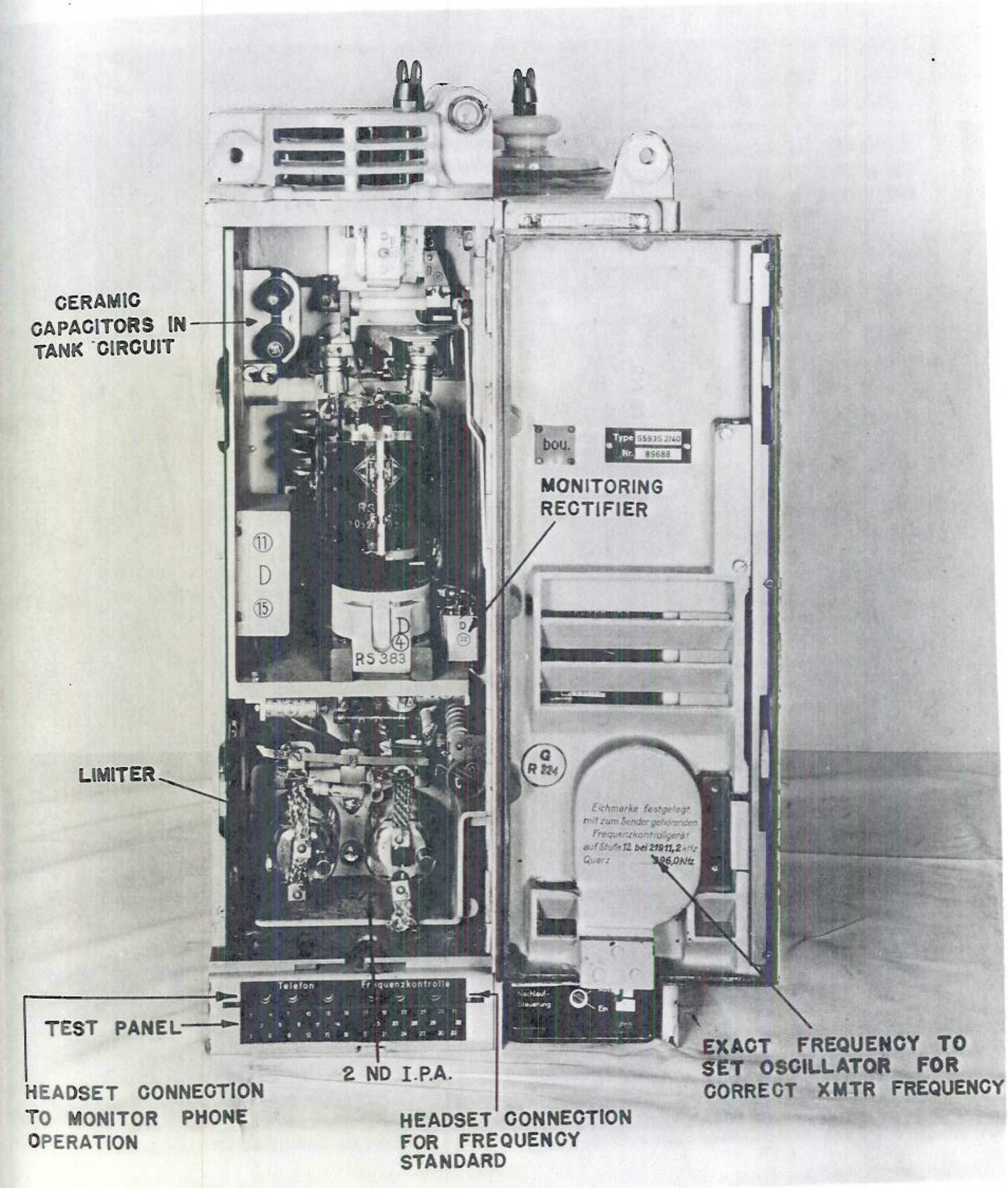
XMTR T200 FK39a - LEFT REAR.



SECTION K - FRONT.

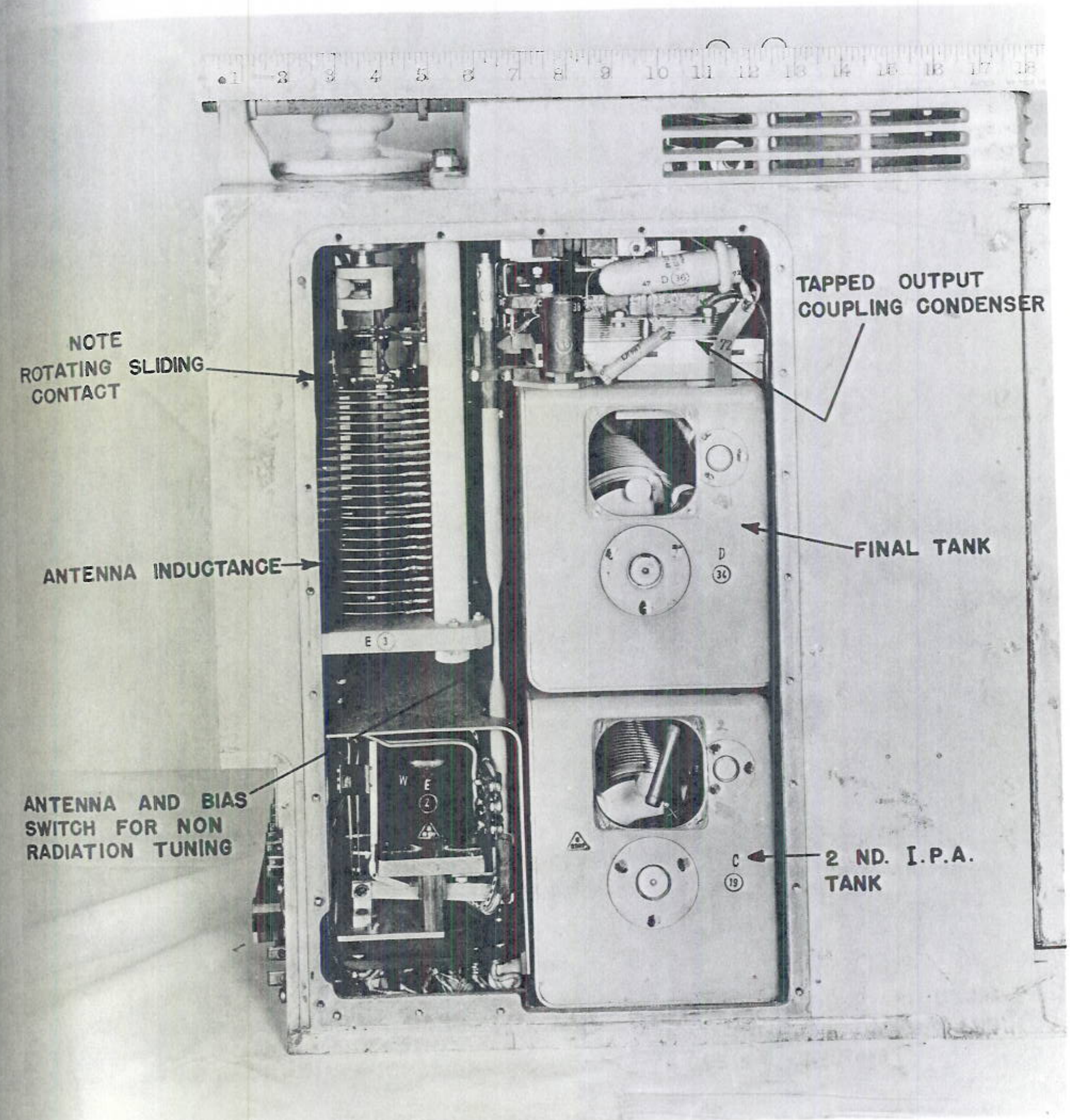


UNIT K DOOR OPEN - P.A. TUBE IN REMOVAL POSITION.



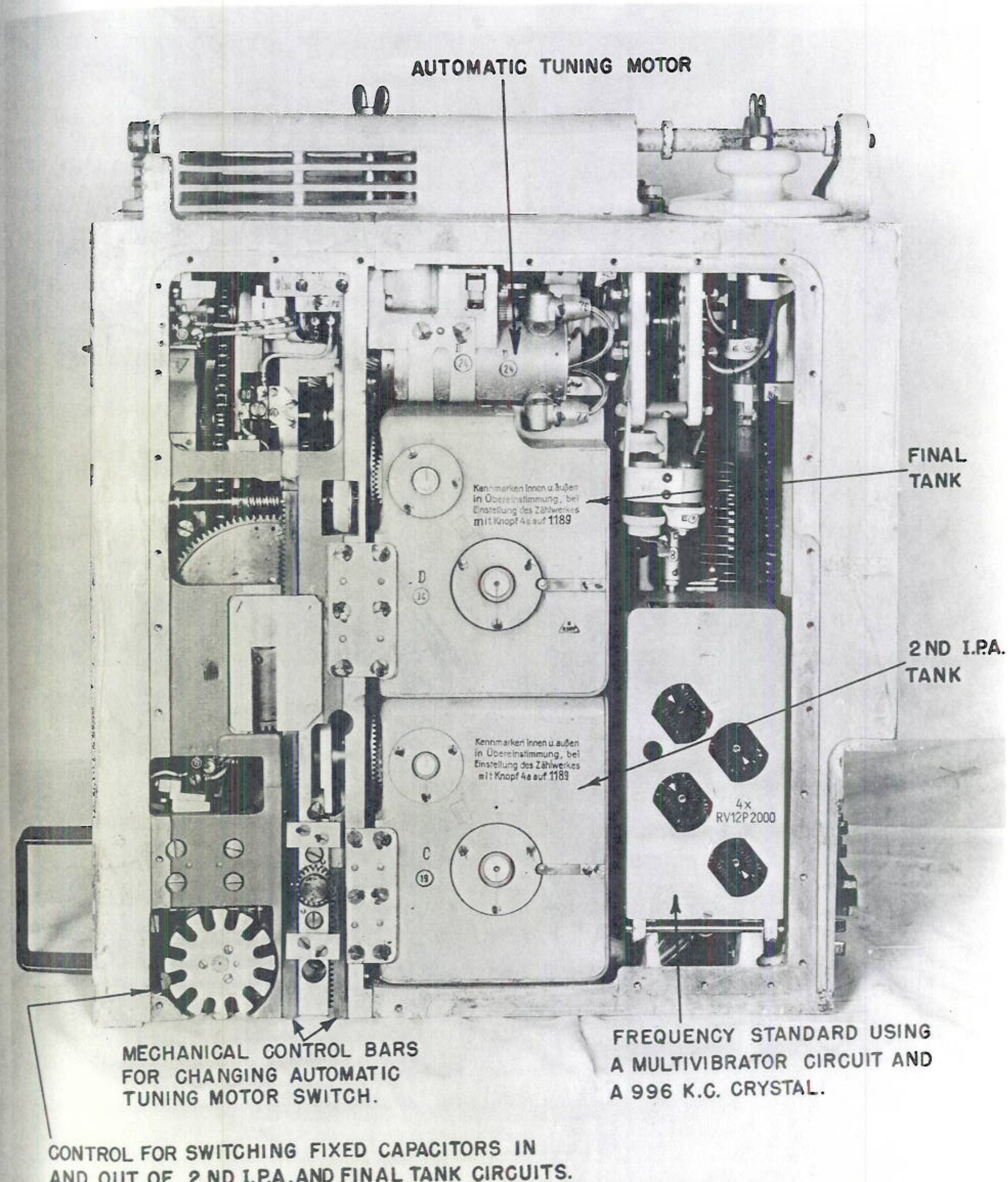
UNIT K - DOOR OPEN.

PLATE 6



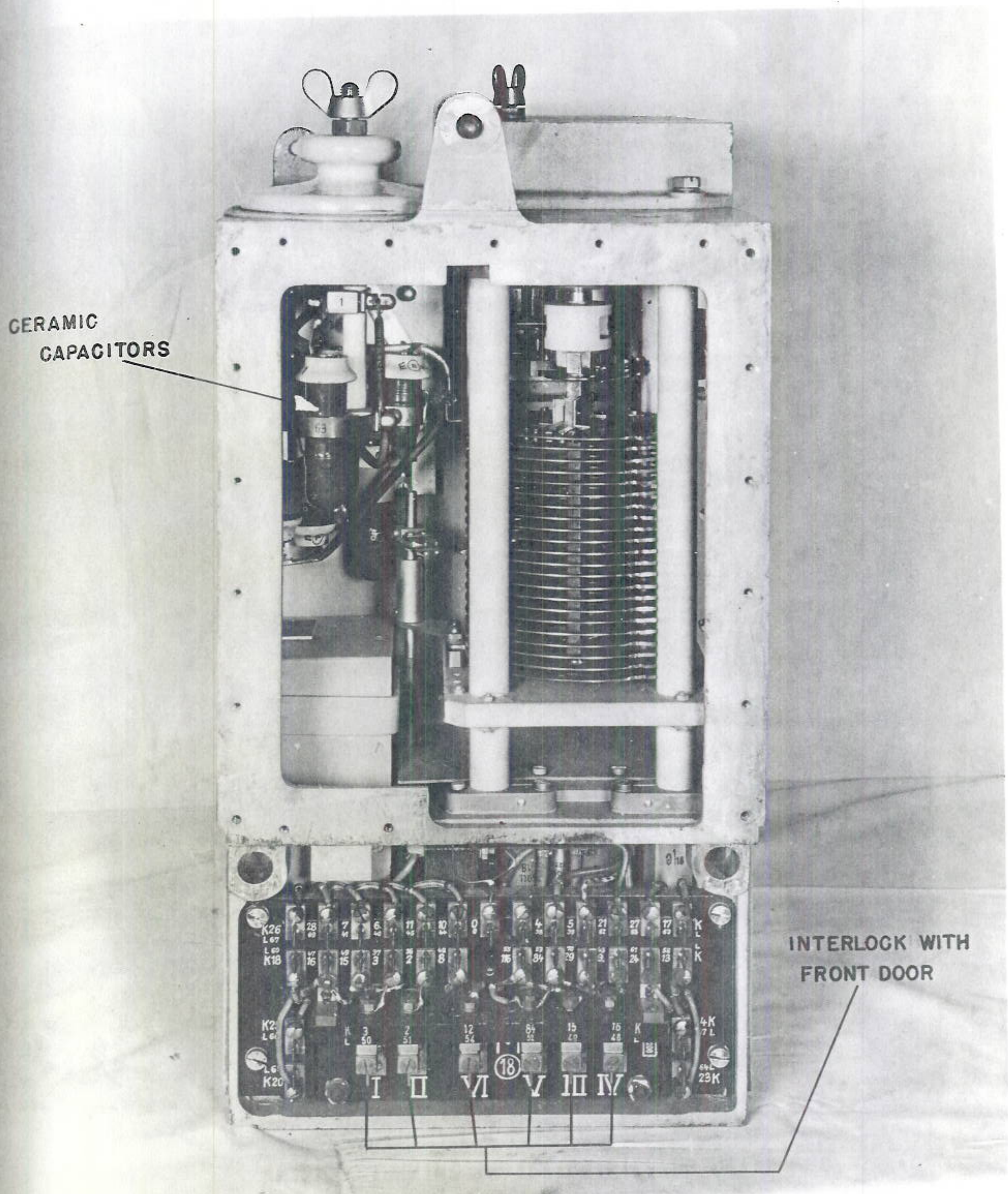
UNIT K - LEFT SIDE.

PLATE 7



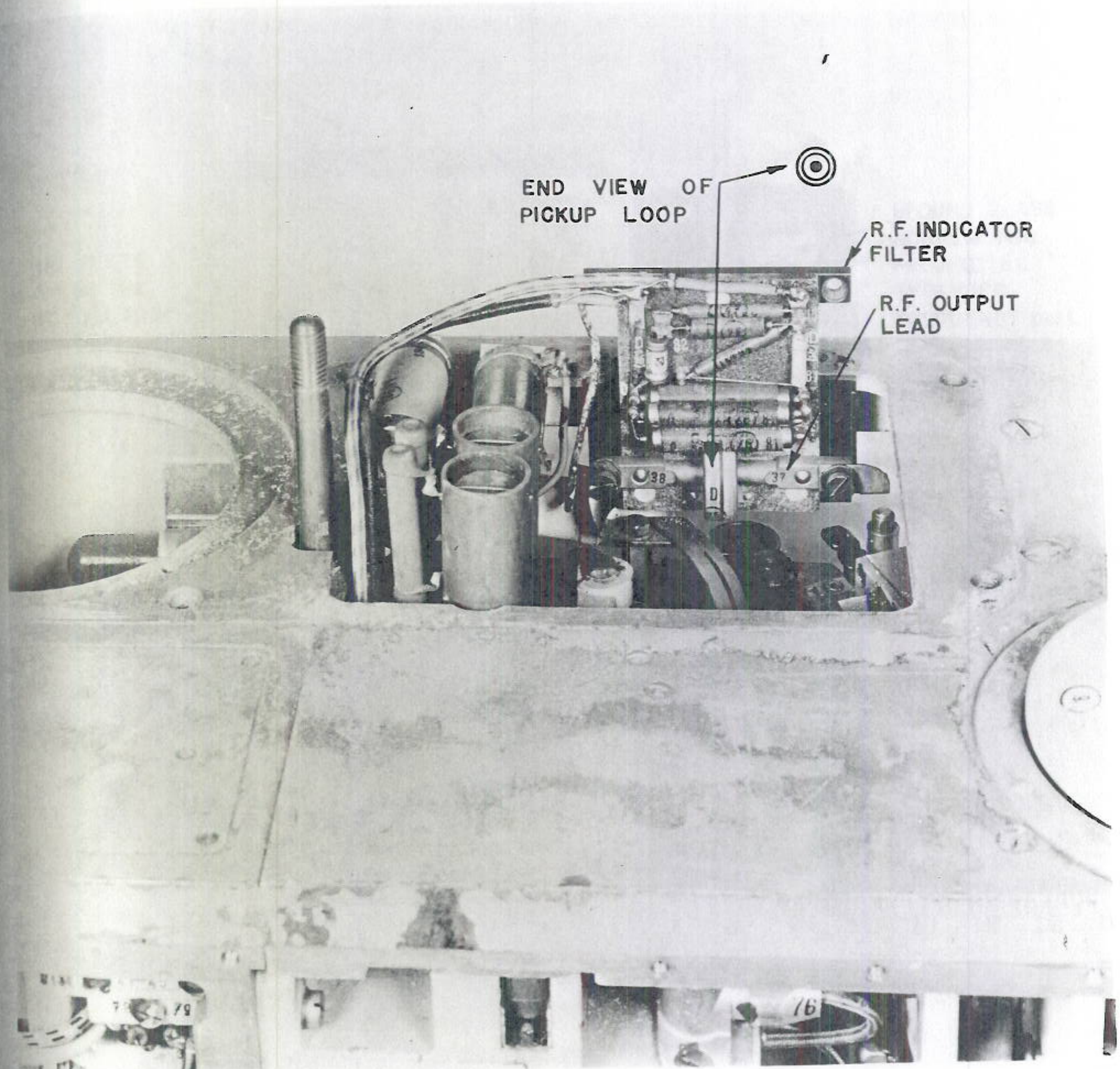
UNIT K - RIGHT SIDE.

PLATE 8

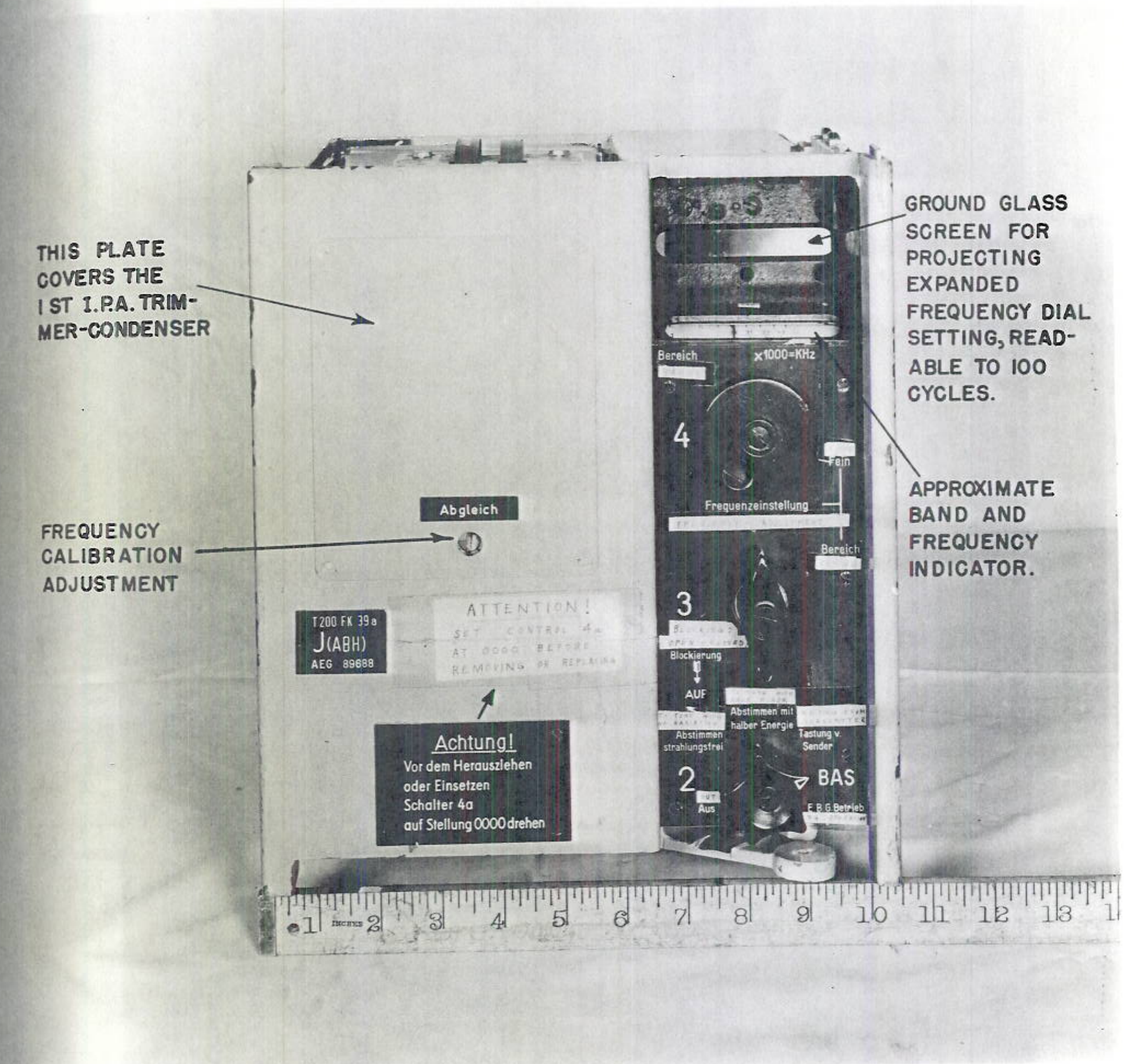


UNIT K - REAR.

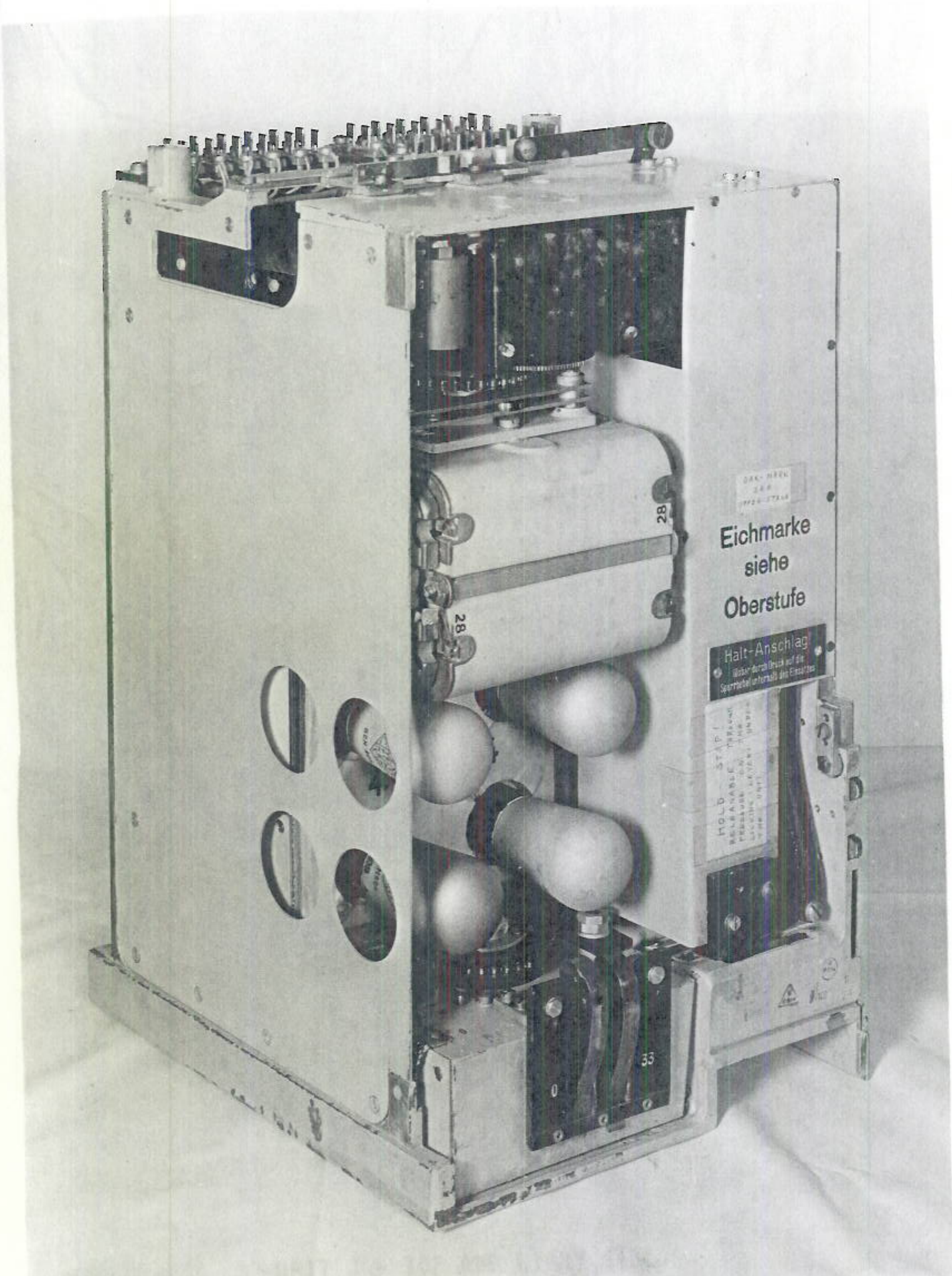
PLATE 9



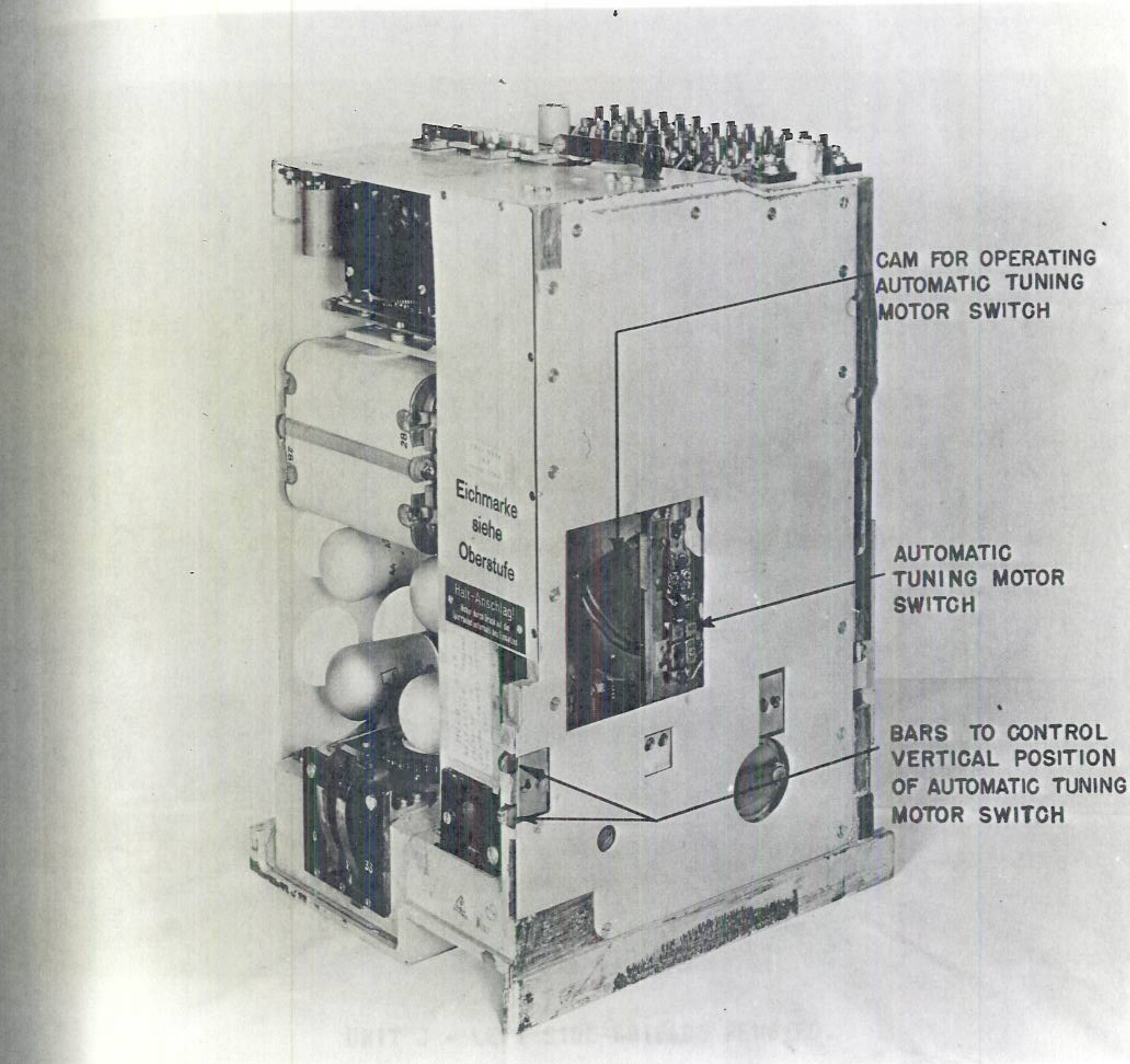
ANTENNA TUNNING INDICATOR PICK UP UNIT


THIS PLATE COVERS THE I ST I.P.A. TRIM-MER-CONDENSER
FREQUENCY CALIBRATION ADJUSTMENT
GROUND GLASS SCREEN FOR PROJECTING EXPANDED FREQUENCY DIAL SETTING, READ-ABLE TO 100 CYCLES.
APPROXIMATE BAND AND FREQUENCY INDICATOR.
Abgleich
T200 FK 39a
J(ABH)
AEG 89888
ATTENTION!
Achtung!
Vor dem Herausziehen
oder Einsetzen
Schalter 4a
auf Stellung 0000 drehen
Bereich
x1000=KHz
Fein
Frequenzeinstellung
Bereich
Blockierung
AUF
Abstimmen mit halber Energie
Abstimmen strahlungsfrei
Tastung v. Sender
BAS
Aus
E.B.G Betrieb

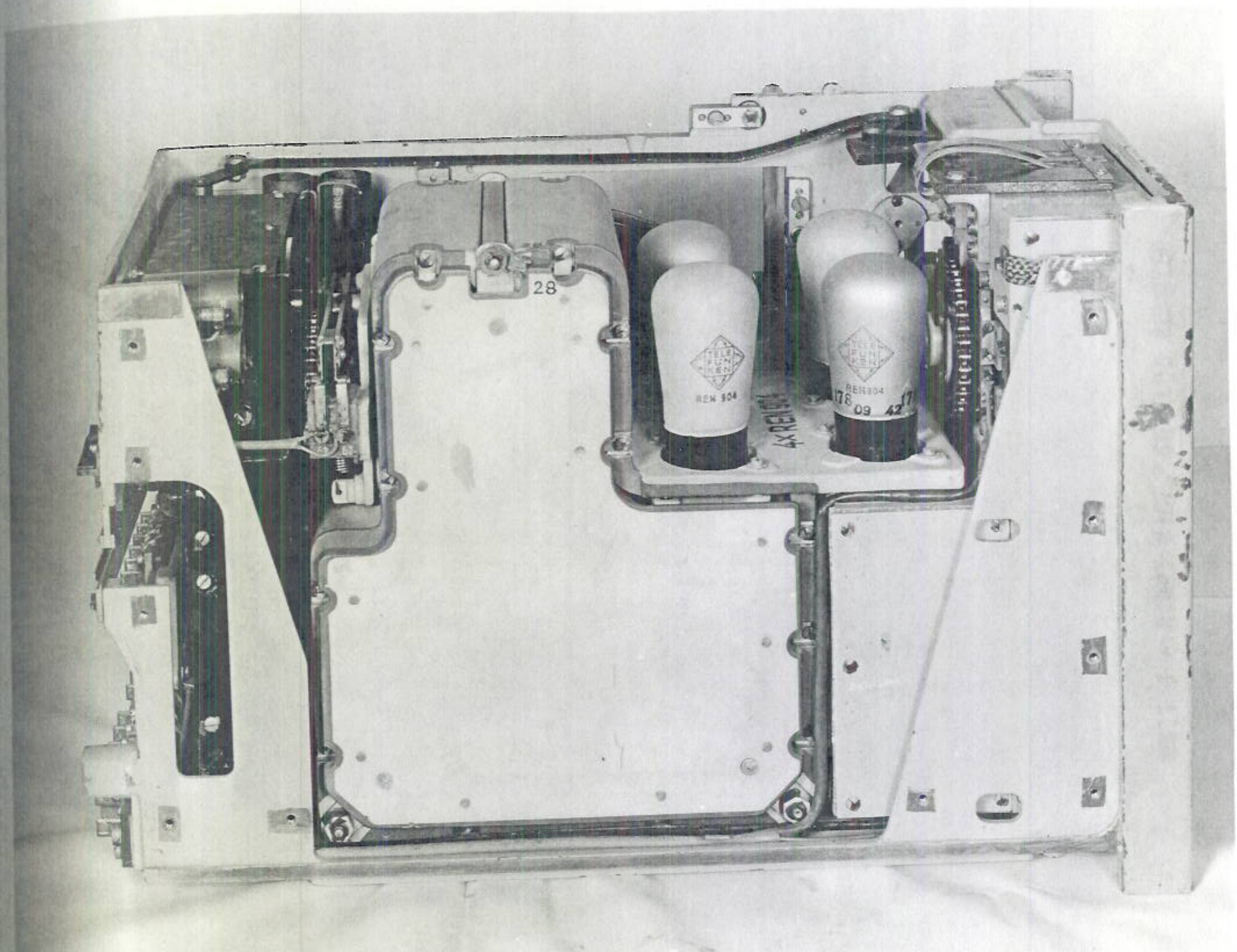
UNIT J - FRONT.



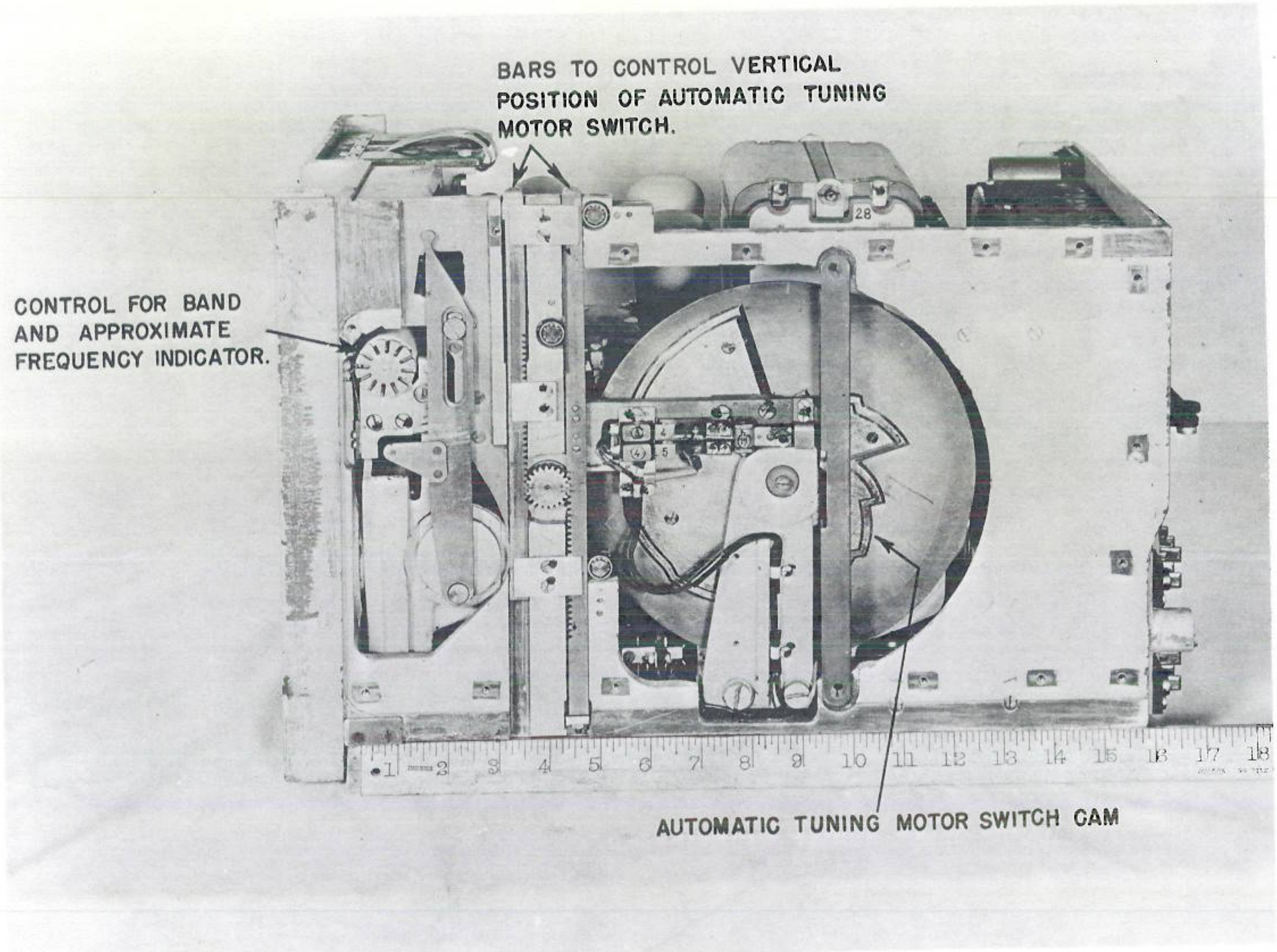
UNIT J - TOP AND LEFT SIDE



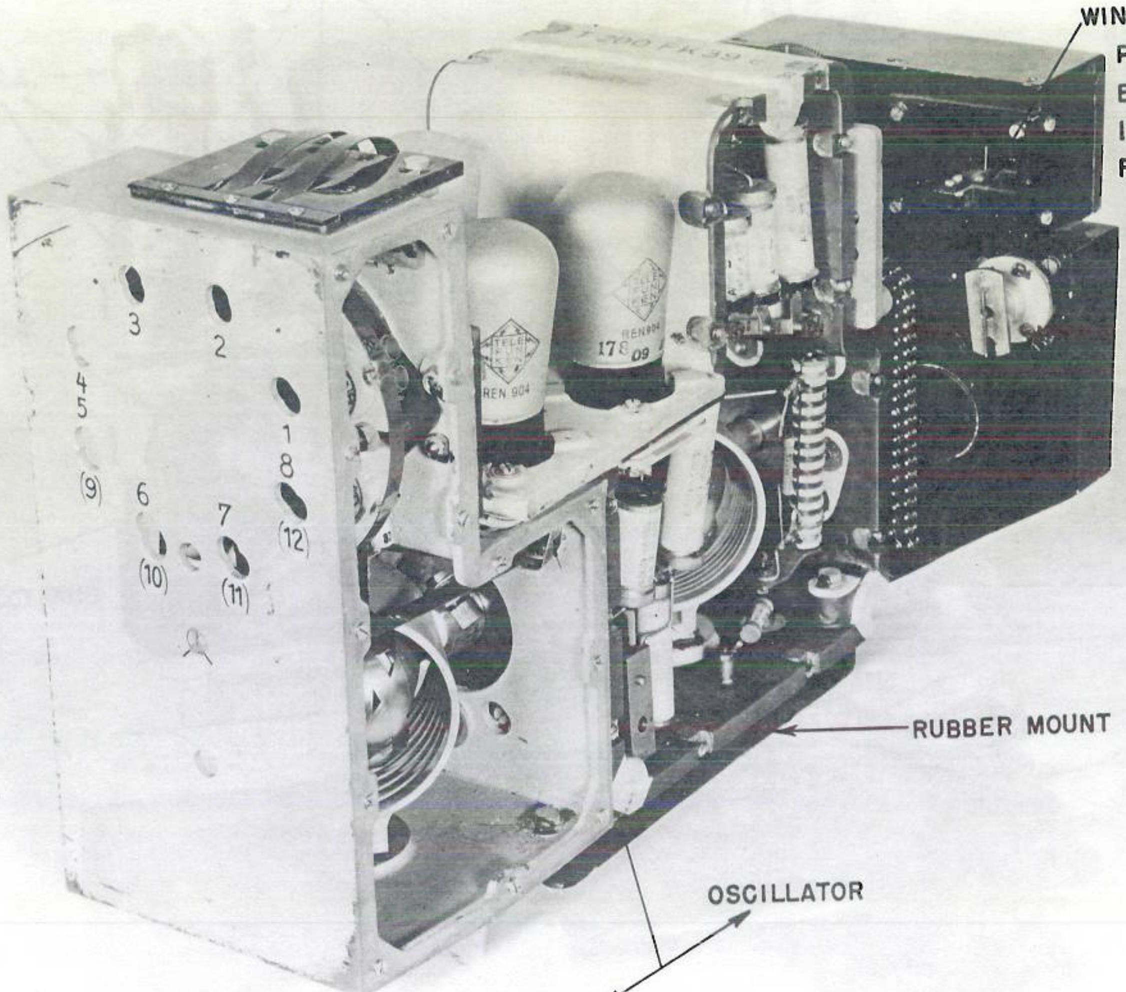
UNIT J - TOP AND RIGHT SIDE.



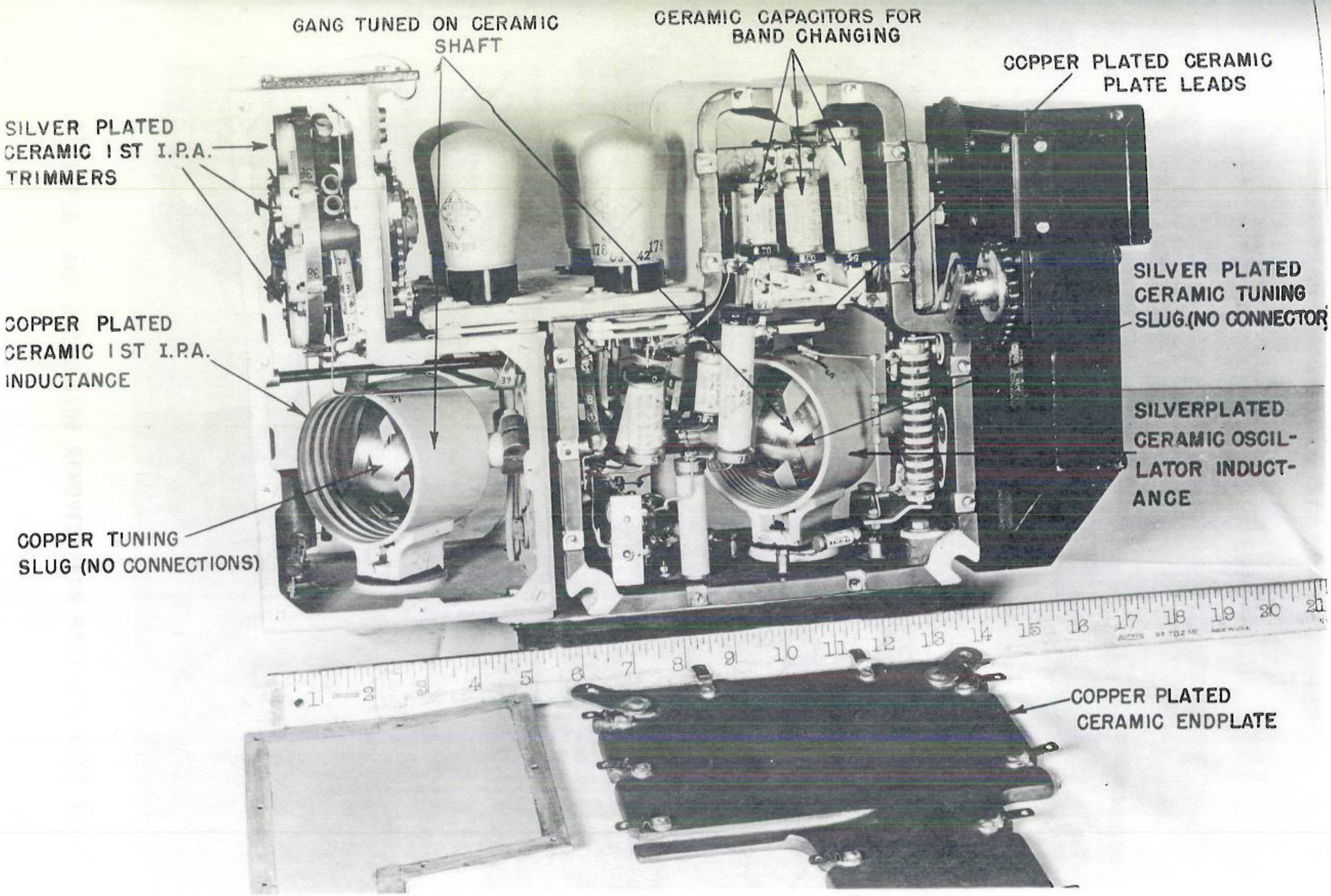
UNIT J - LEFT SIDE SHIELDS REMOVED.



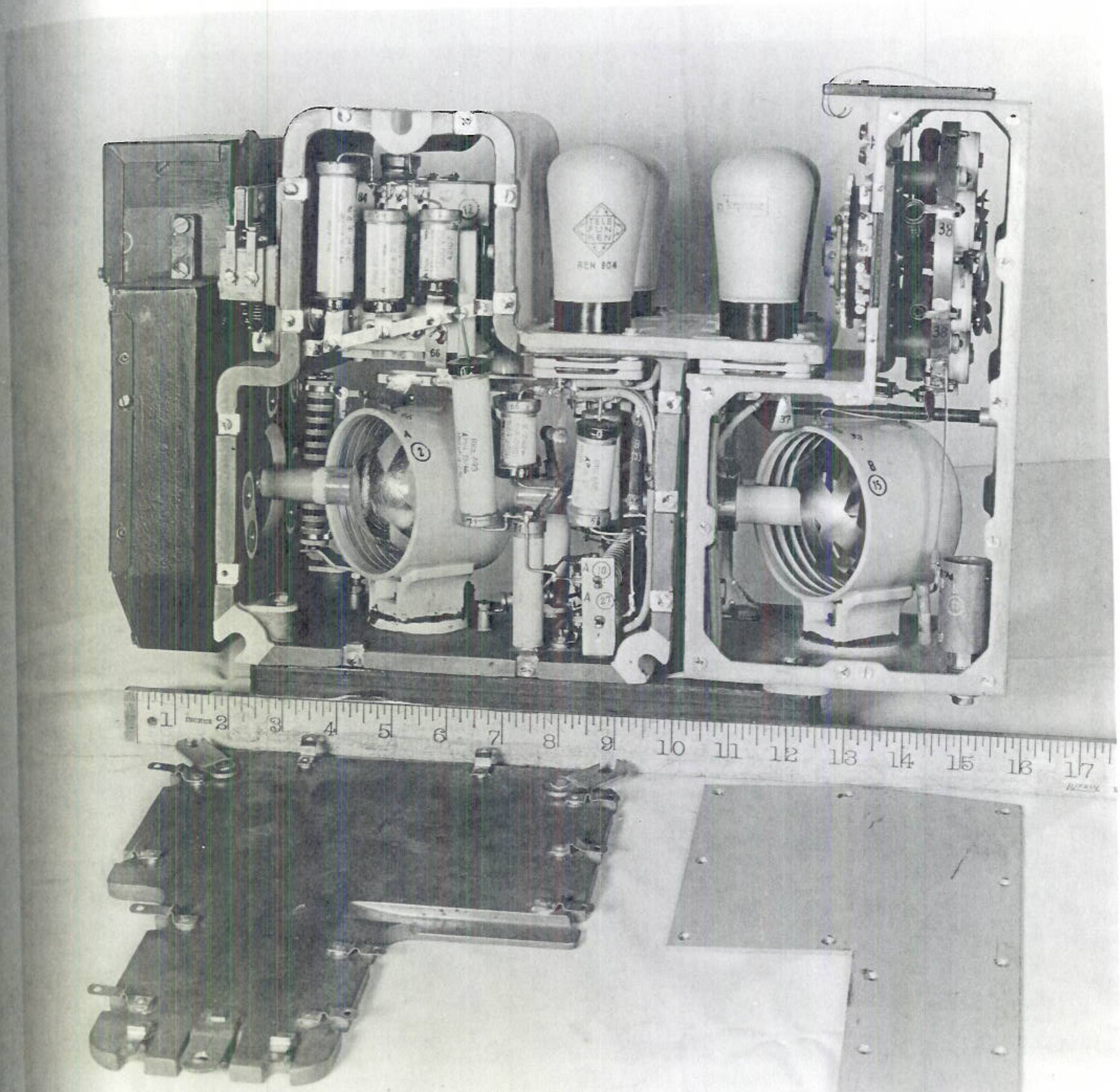
UNIT J - RIGHT SIDE, SHIELDS REMOVED.



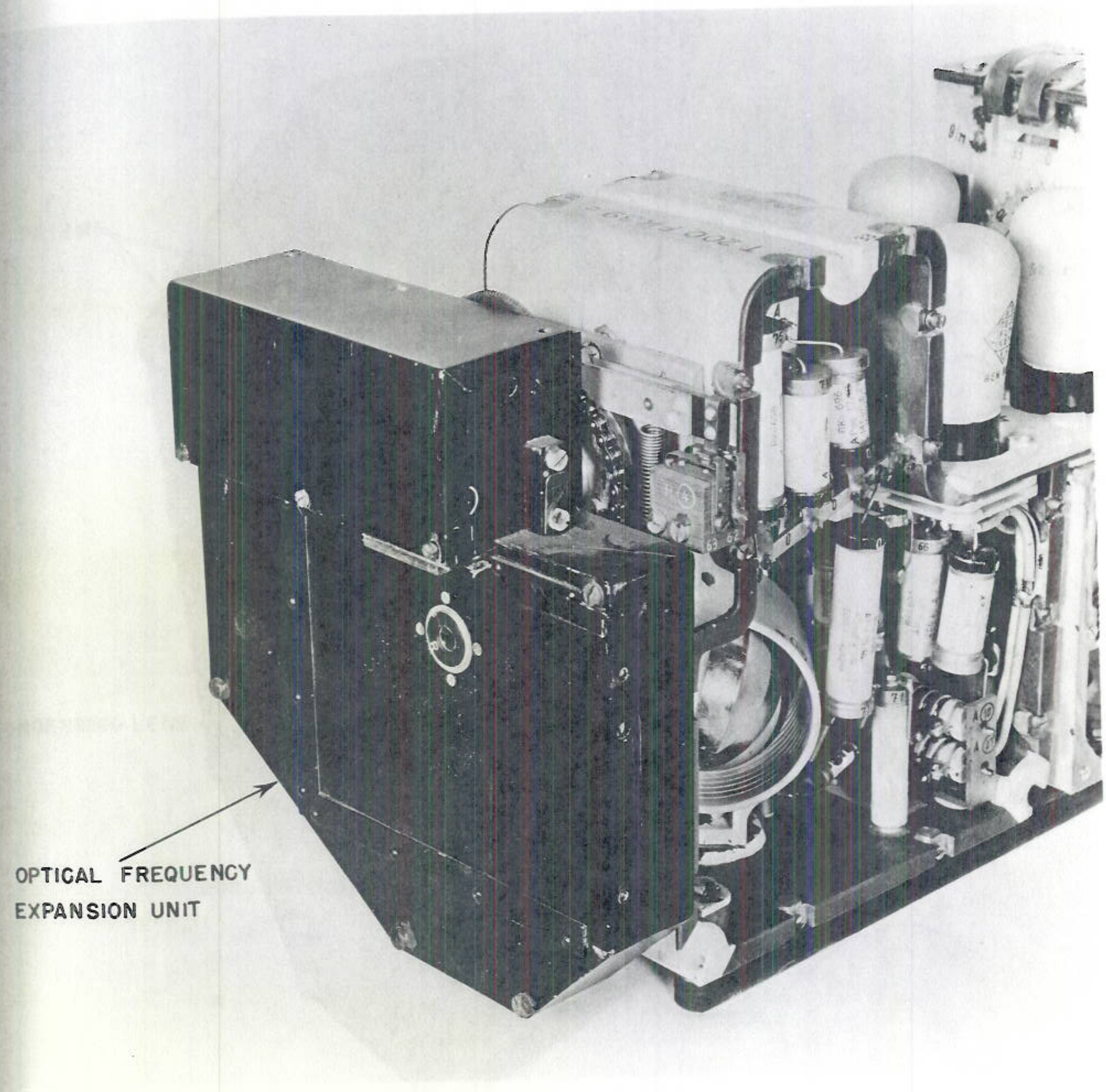
1st I.P.A. AND OSCILLATOR REMOVED FROM UNIT J - RIGHT FRONT.



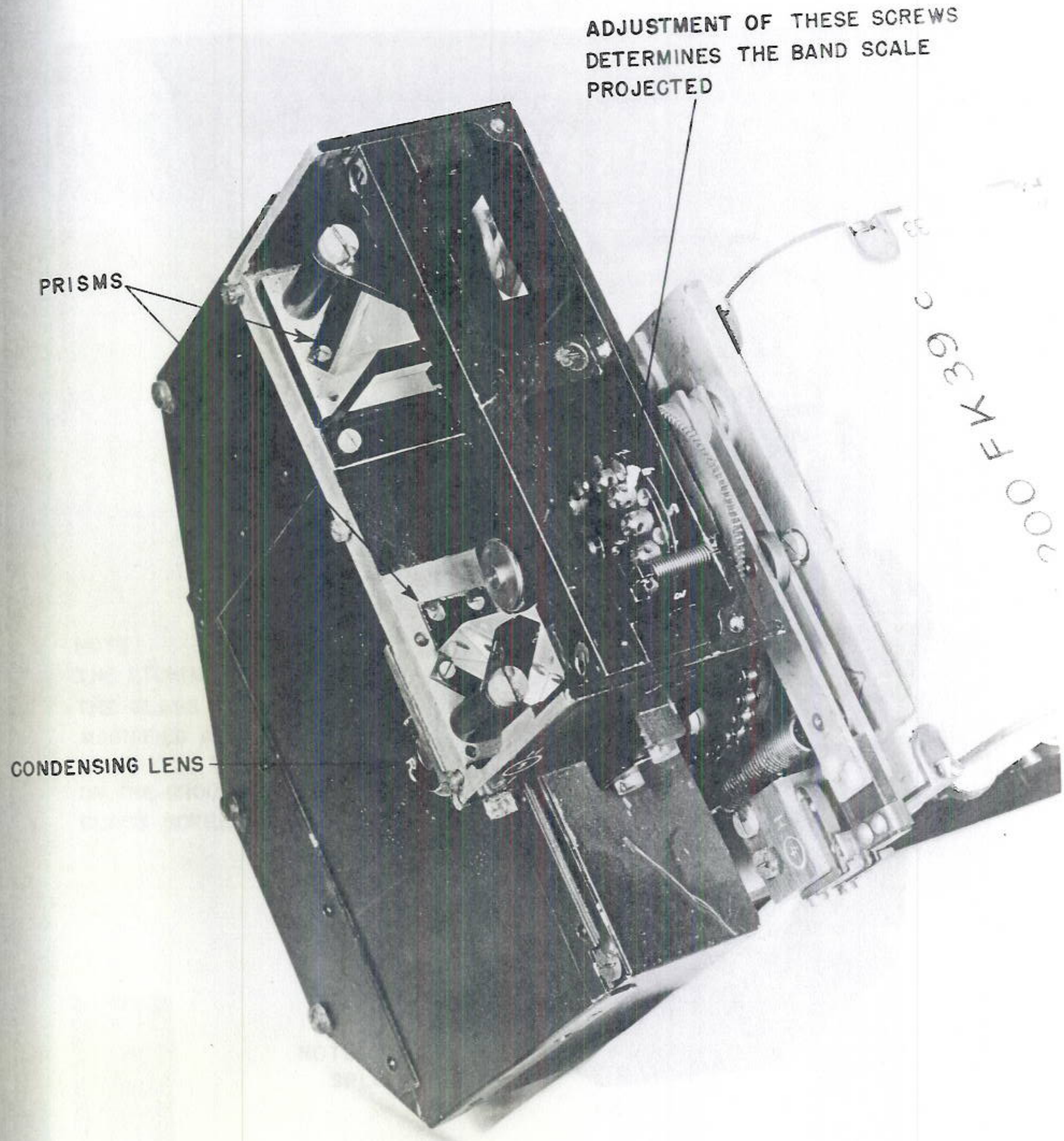
OSCILLATOR AND 1st I.P.A. - RIGHT SIDE.



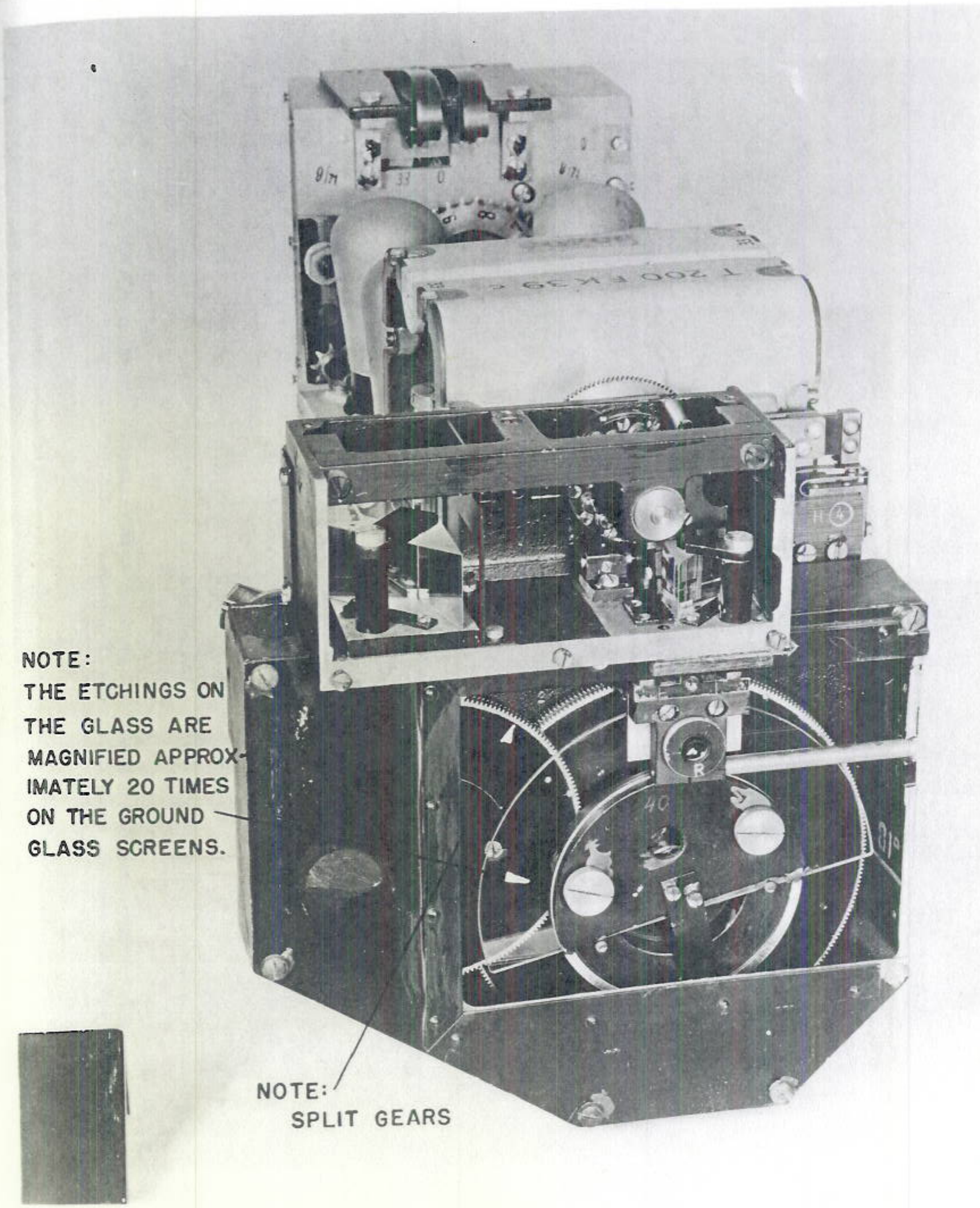
1st I.P.A. AND OSCILLATOR REMOVED FROM UNIT J - LEFT SIDE.



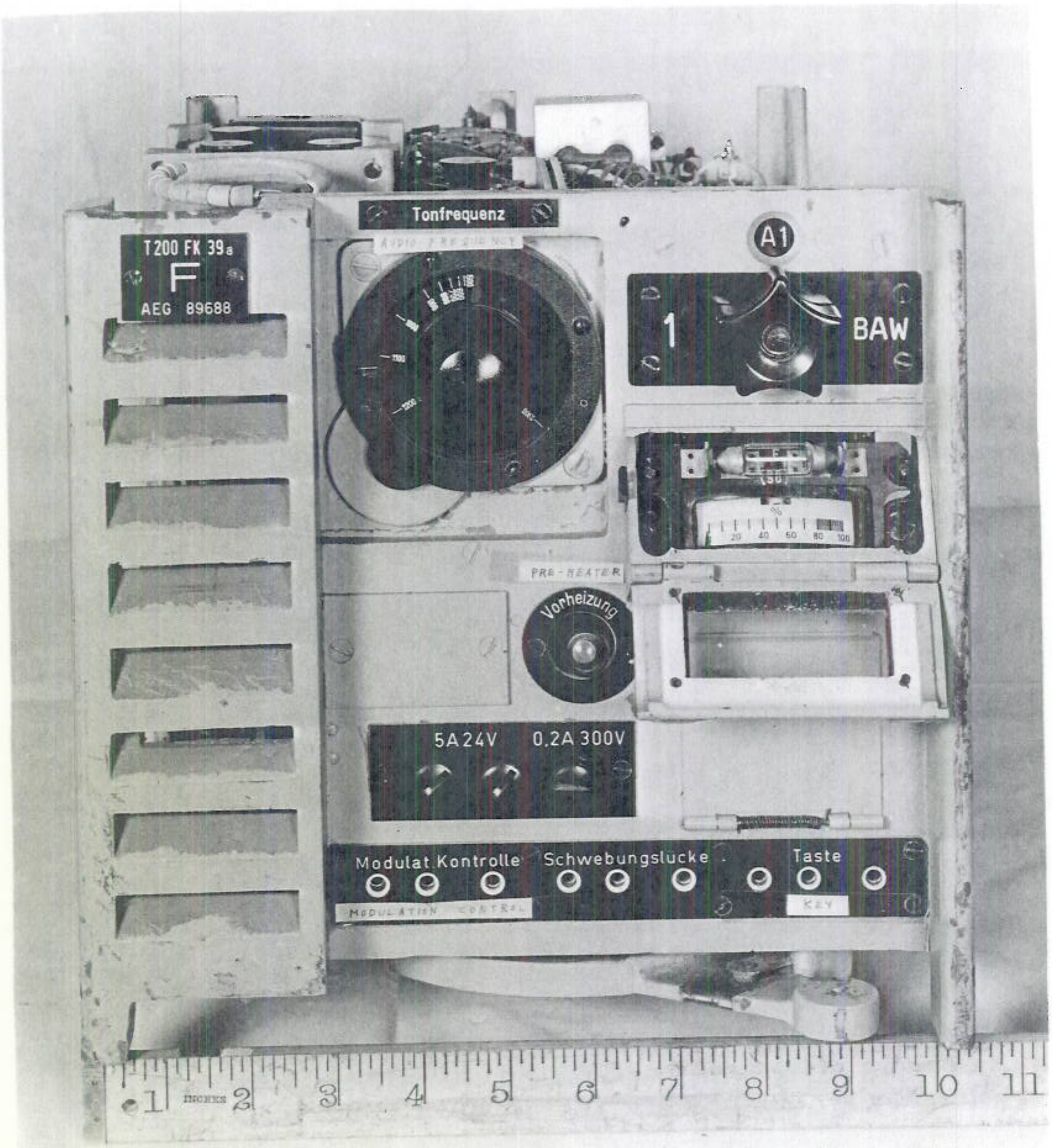
1st. I.P.A. AND OSCILLATOR REMOVED FROM UNIT J - REAR.



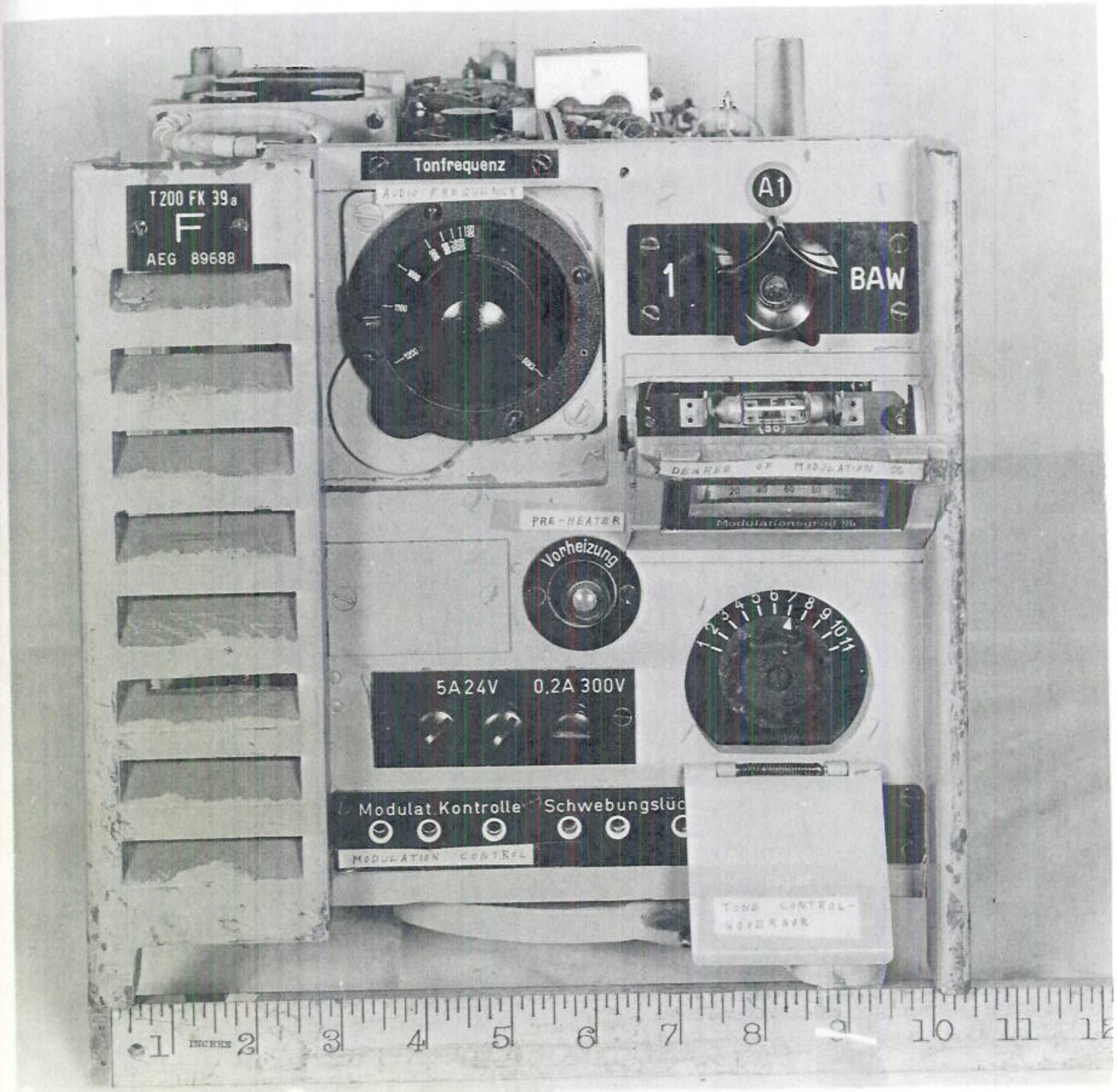
1st I.P.A. AND OSCILLATOR REMOVED FROM UNIT J - REAR VIEW.



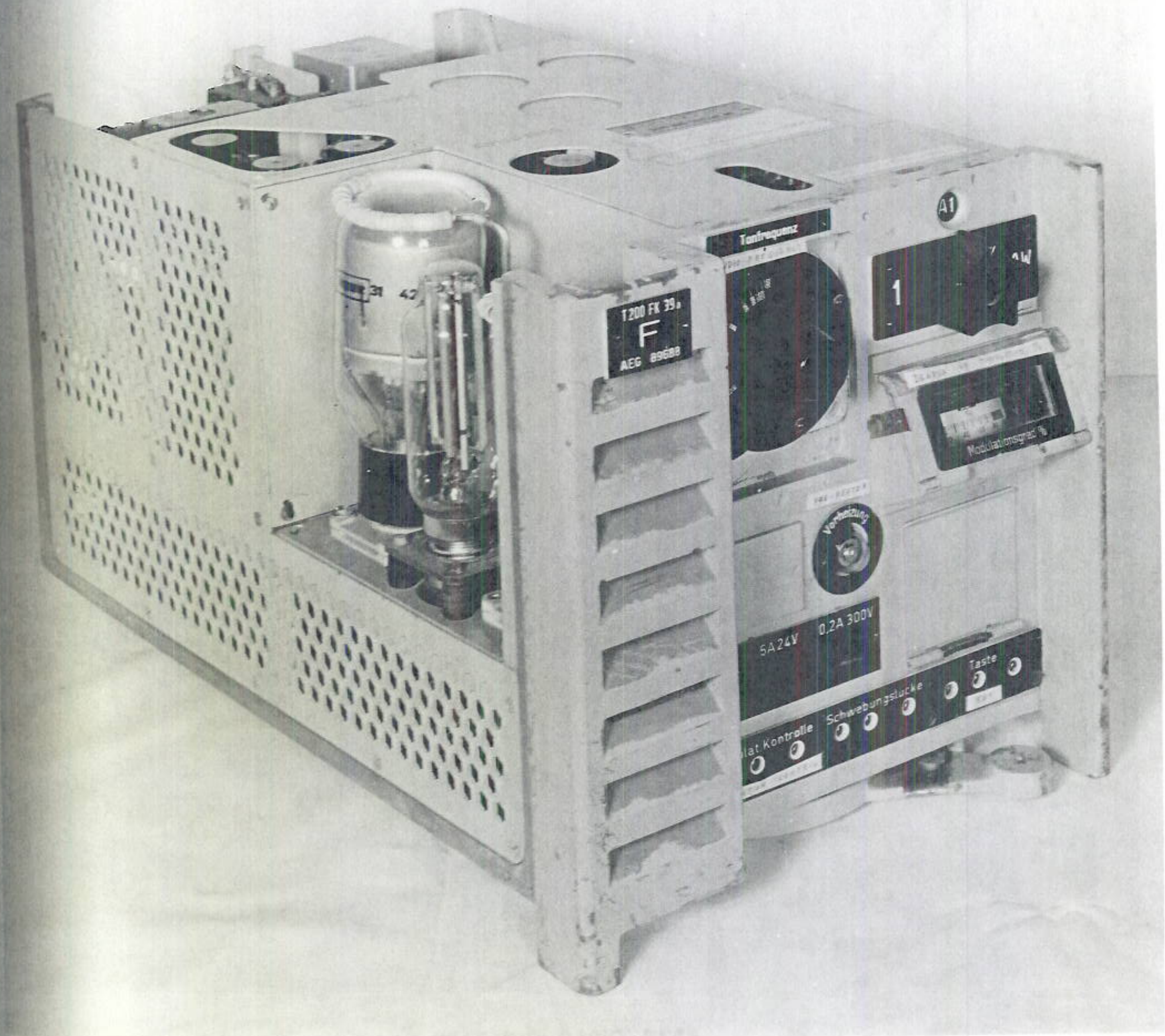
1st I.P.A. AND OSCILLATOR REMOVED FROM UNIT J
REAR VIEW WITH COVER PLATES REMOVED FROM THE OPTICAL SYSTEM.



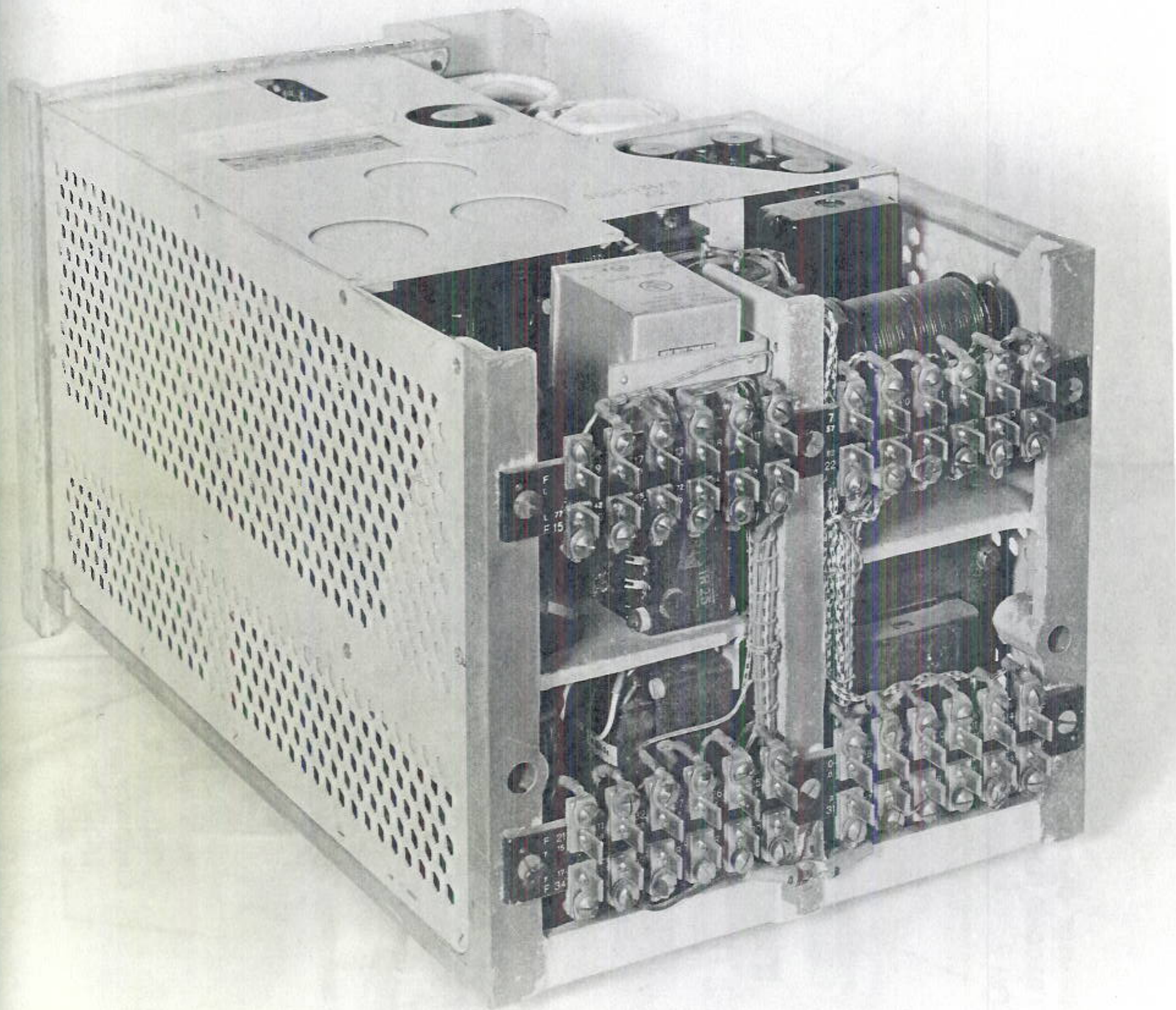
UNIT F - FRONT VIEW



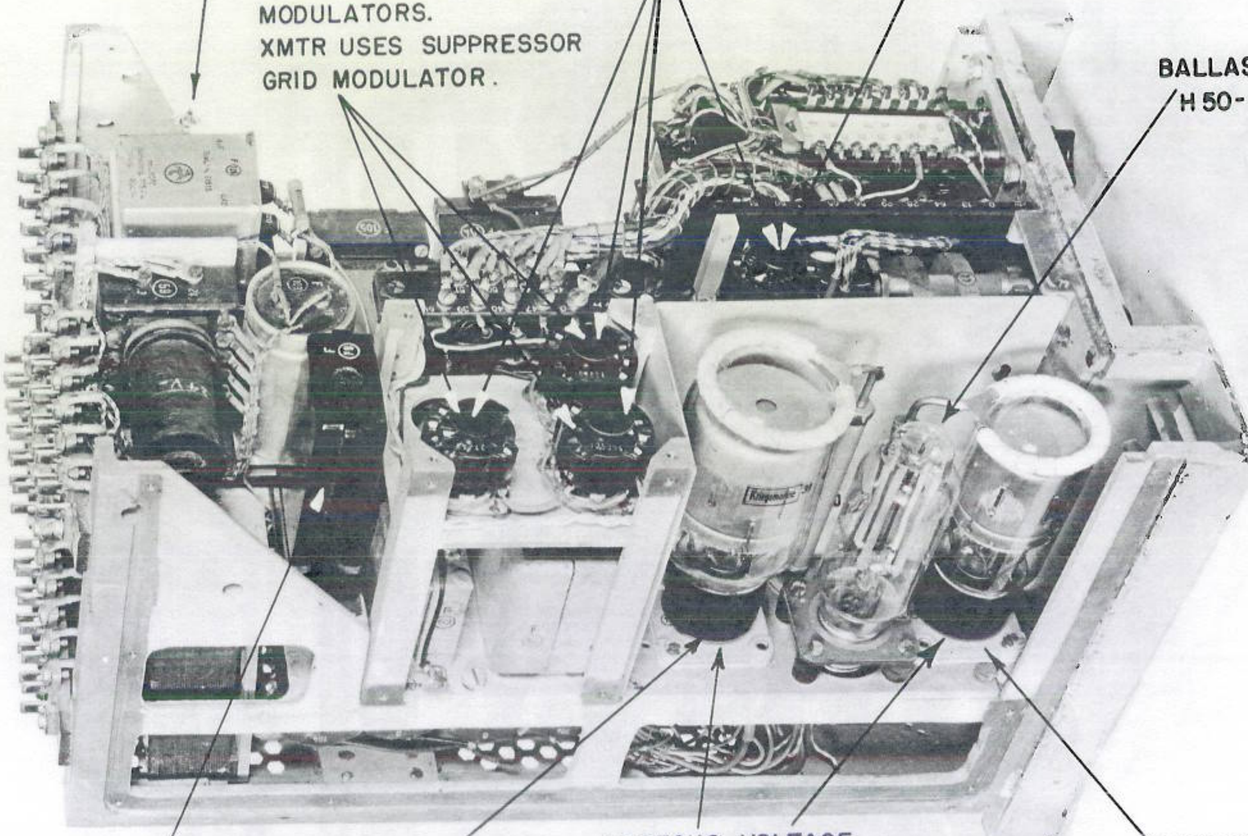
UNIT F - FRONT VIEW - ALL CONTROL COVERS REMOVED.



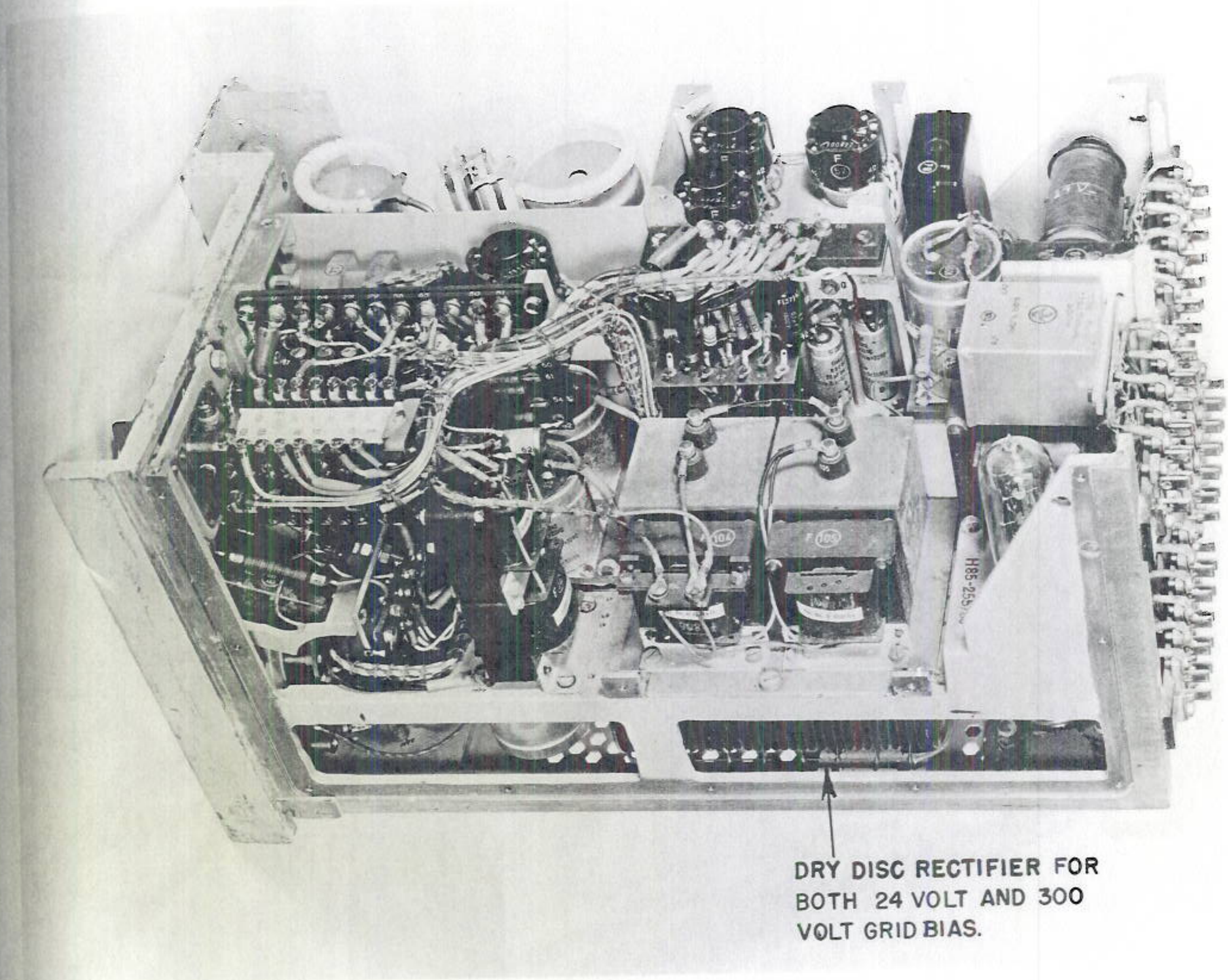
UNIT F - LEFT SIDE



UNIT F - RIGHT REAR

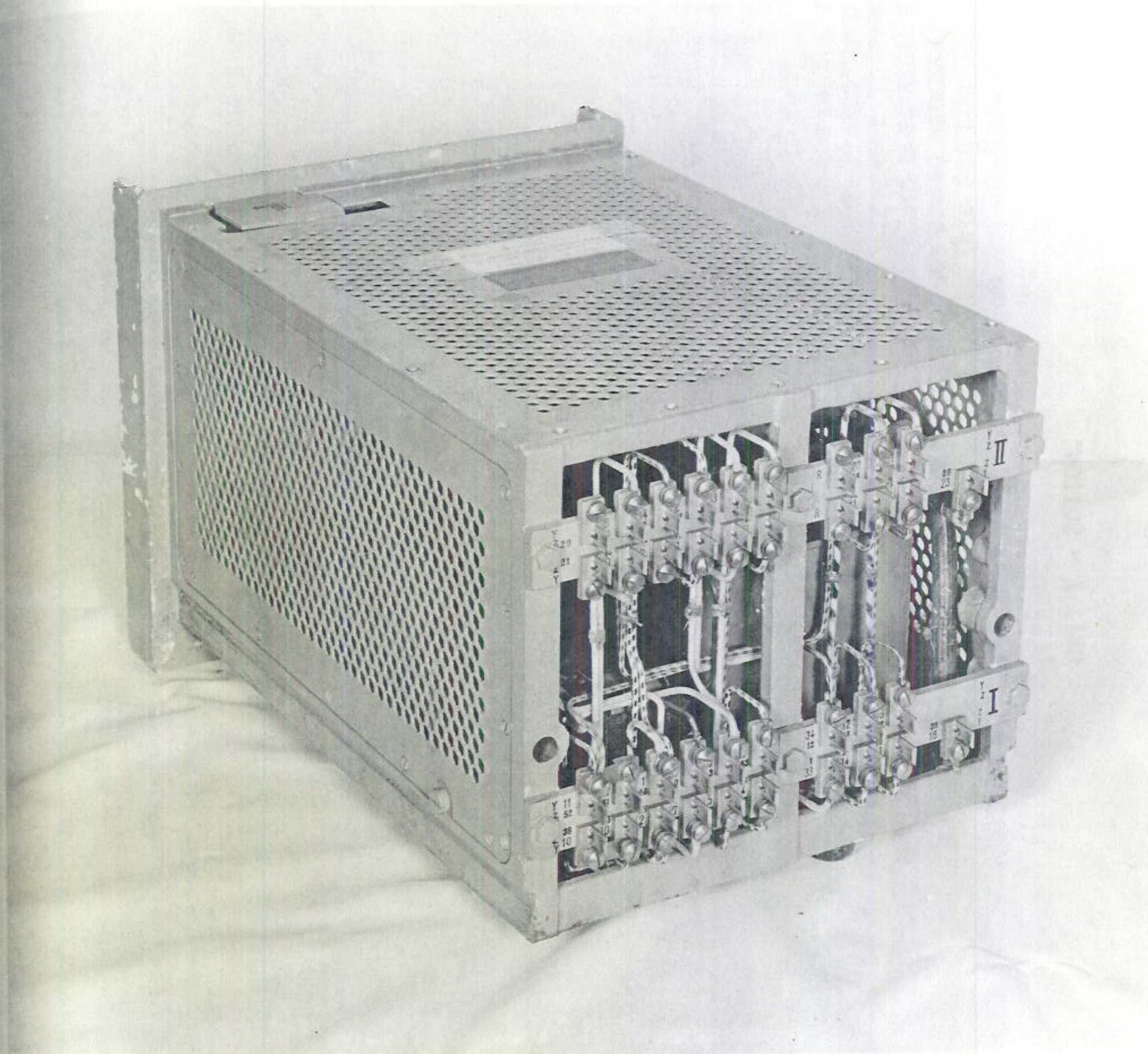


UNIT F - LEFT FRONT, SHIELDS OFF.

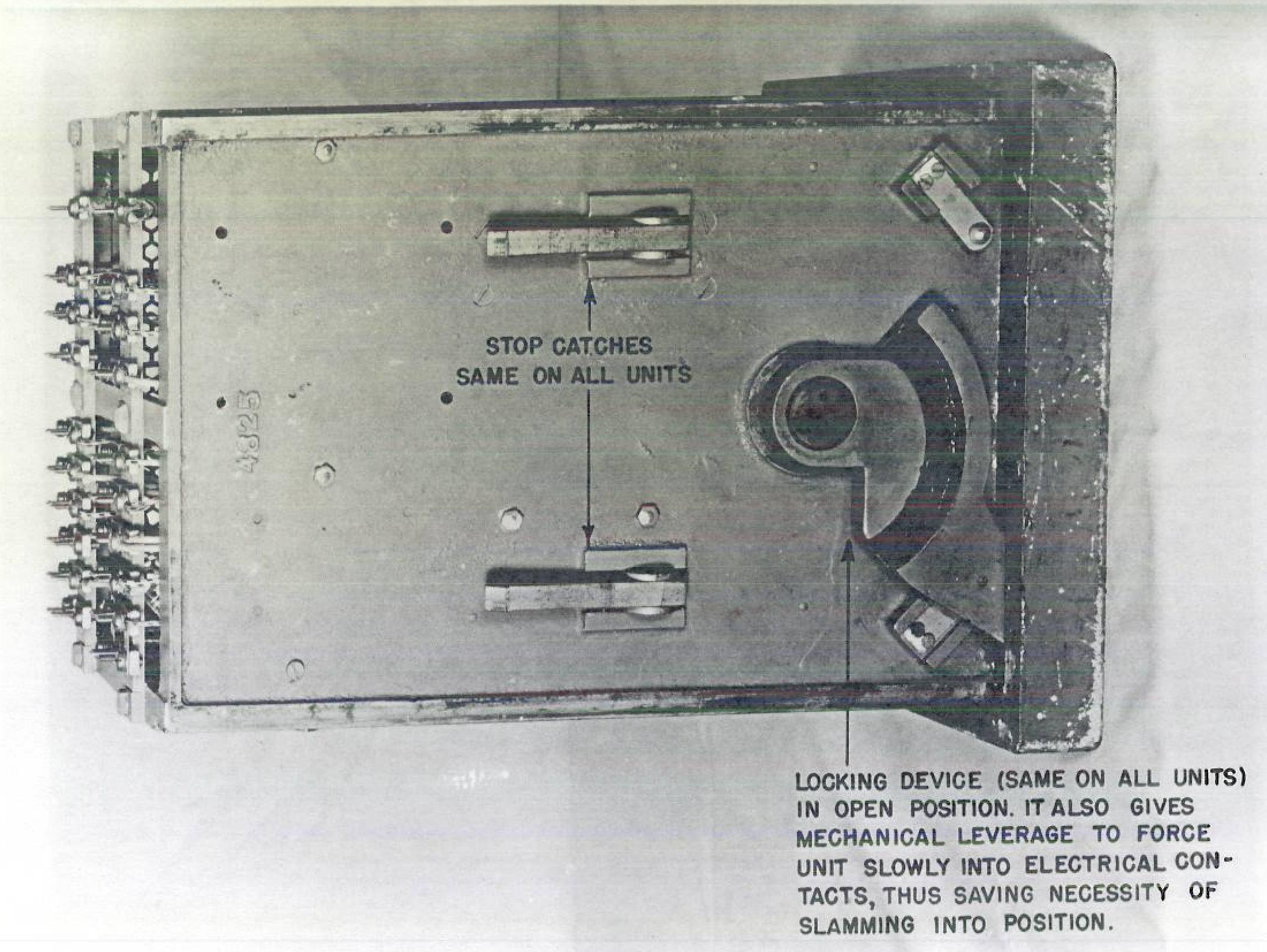


UNIT F - RIGHT SIDE SHIELDS OFF.

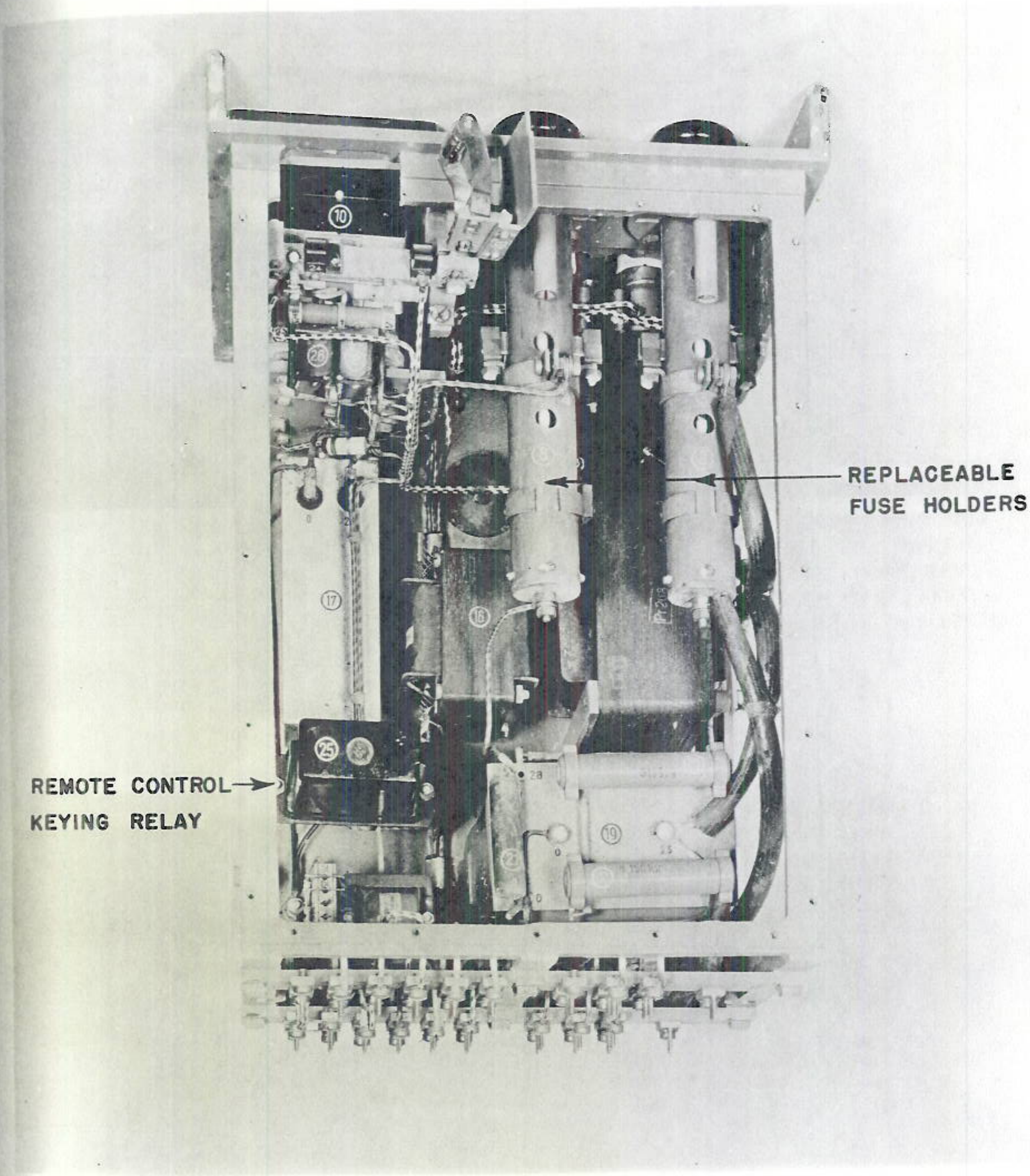
UNIT Y – LEFT FRONT.



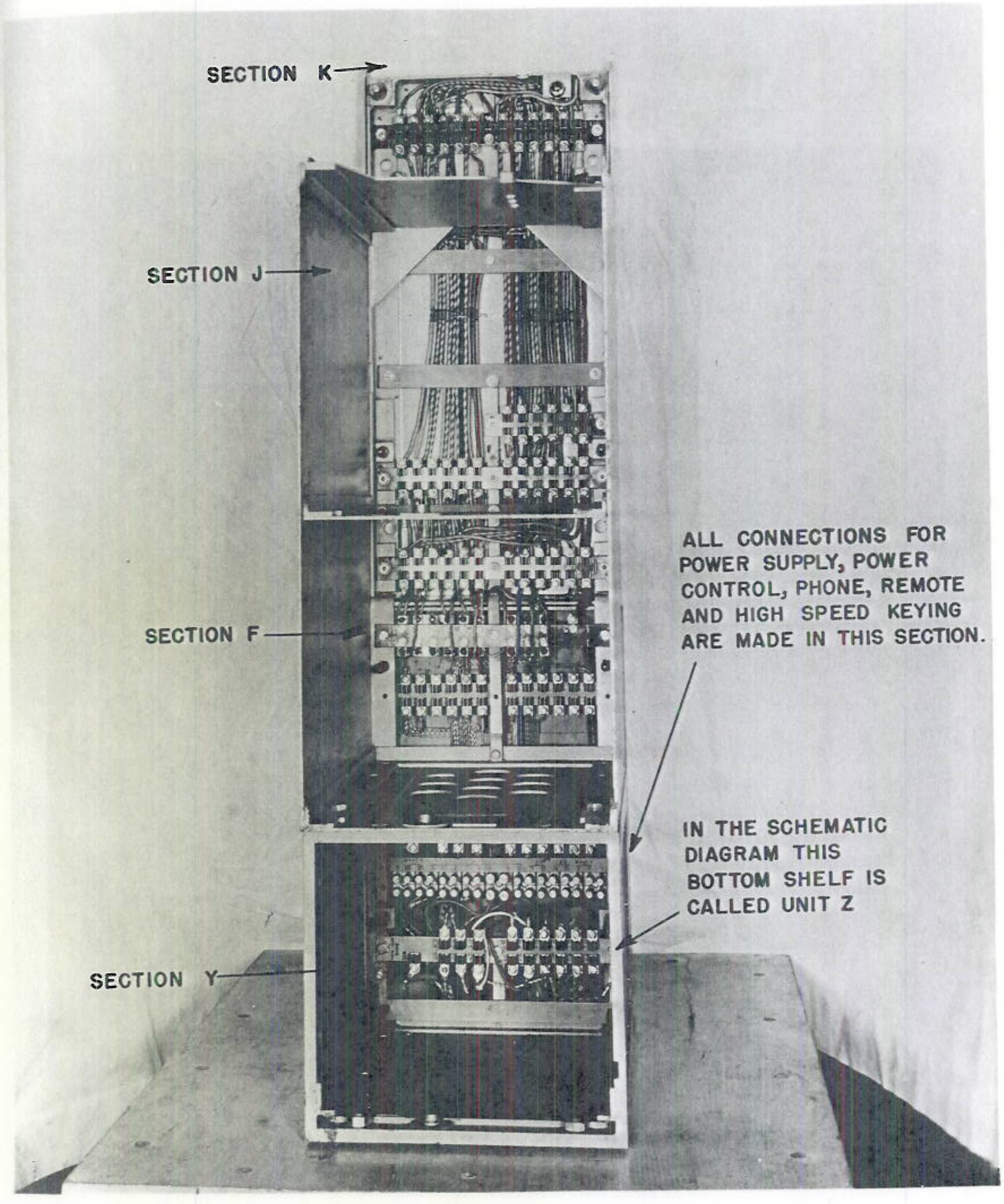
UNIT Y - RIGHT REAR.



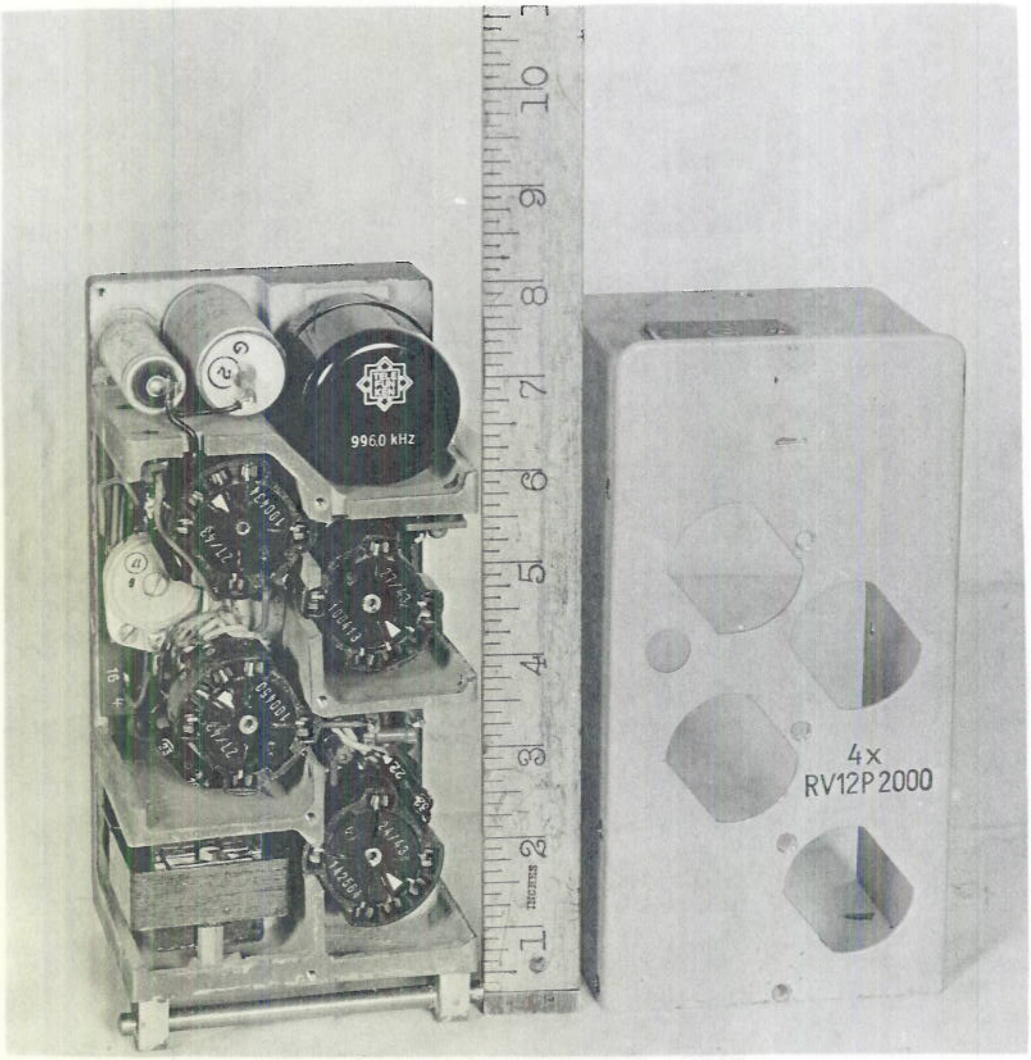
UNIT Y - BOTTOM.



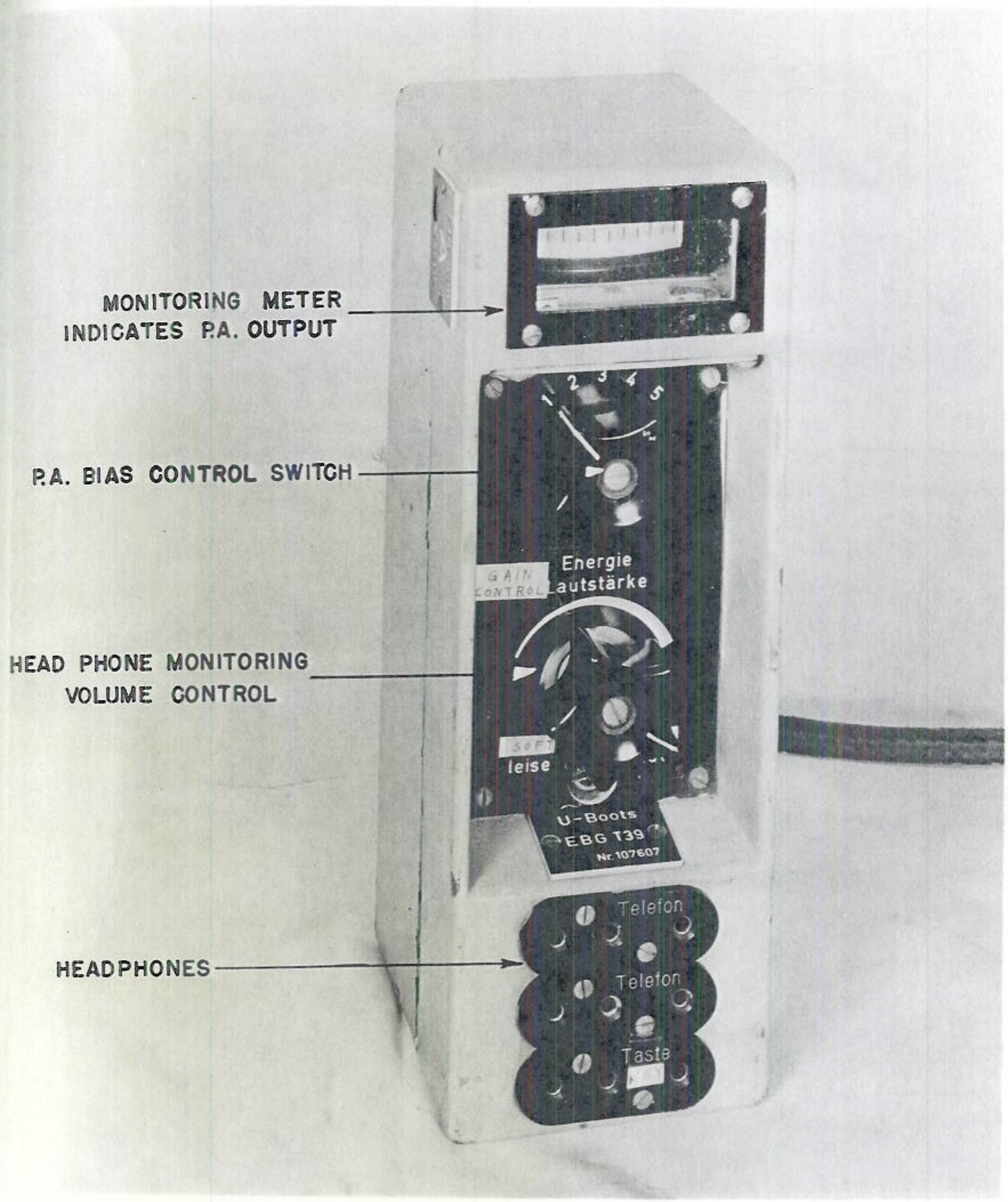
UNIT Y. TOP SHIELD OFF.



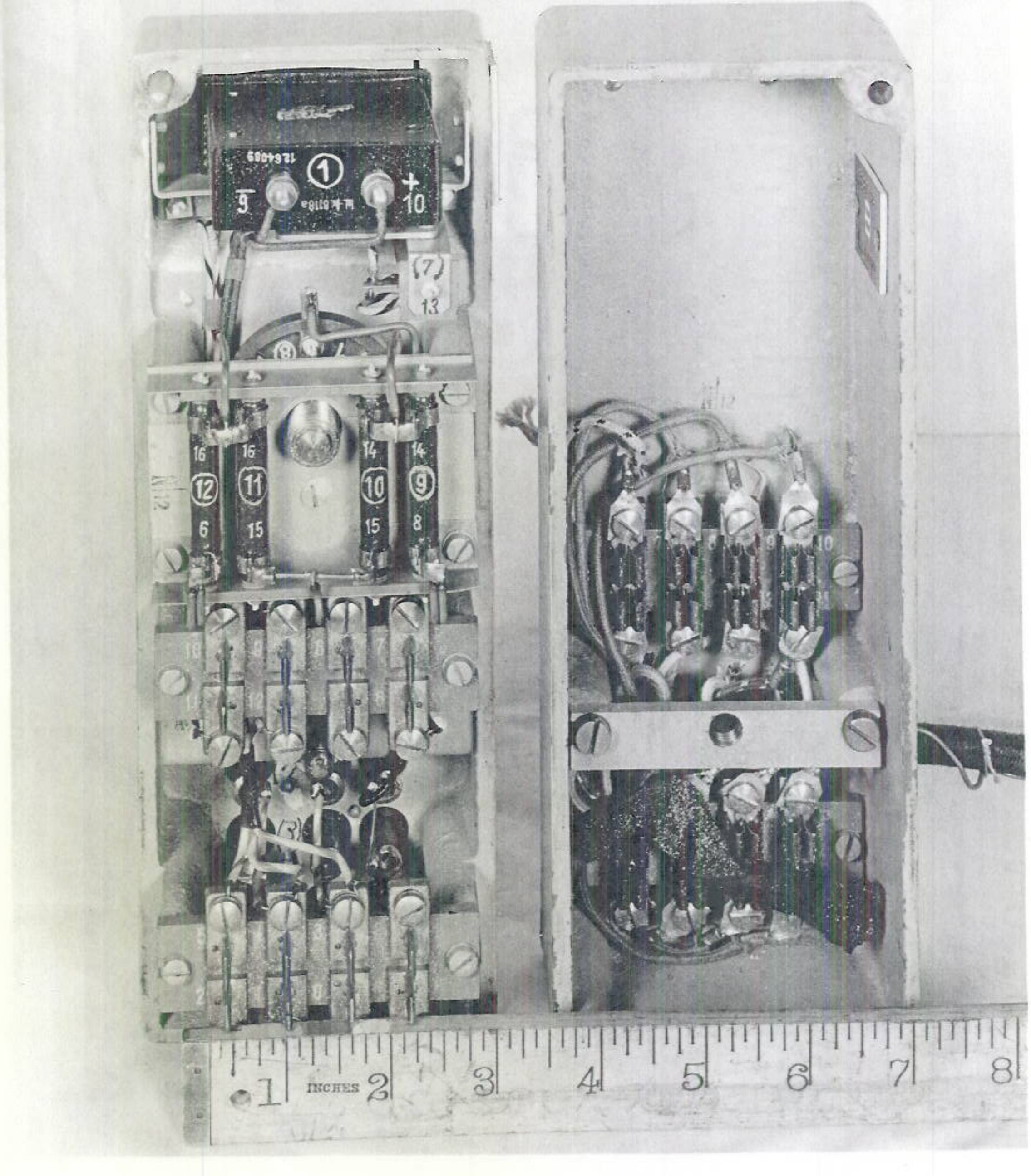
XMTR MAIN FRAME AND TERMINAL BOARD - FRONT.



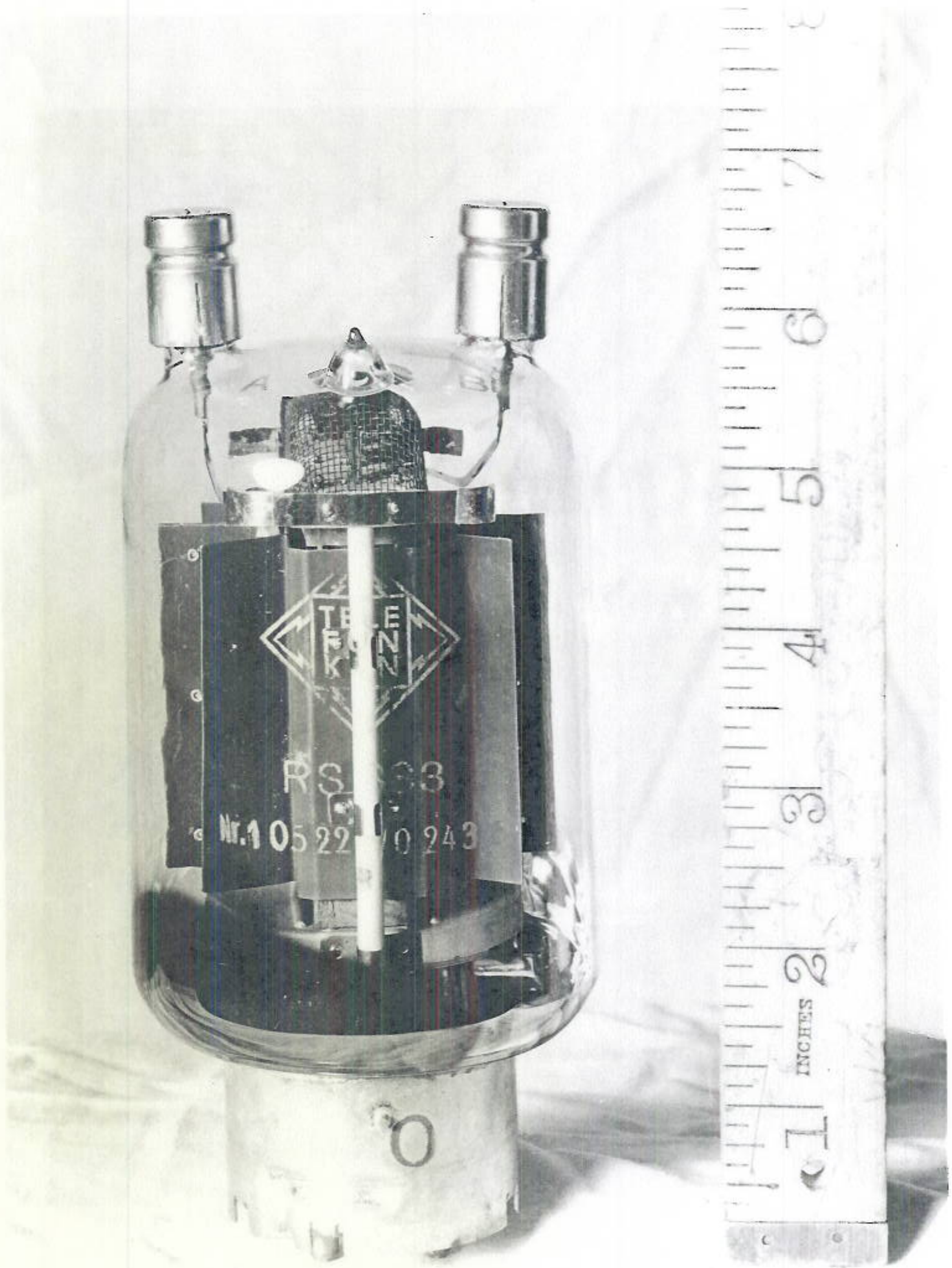
FREQUENCY STANDARD. PART OF UNIT K.



REMOTE UNIT A



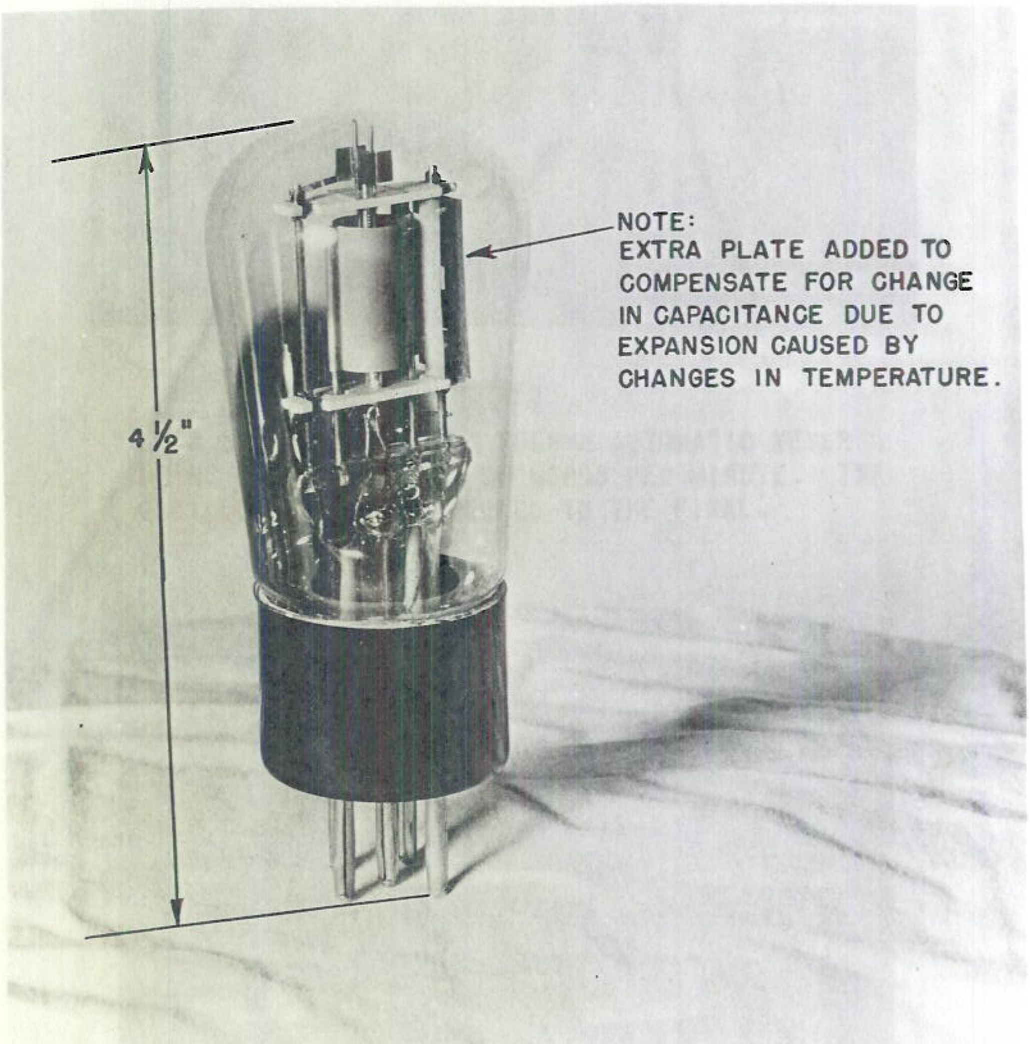
INSIDE OF REMOTE UNIT A



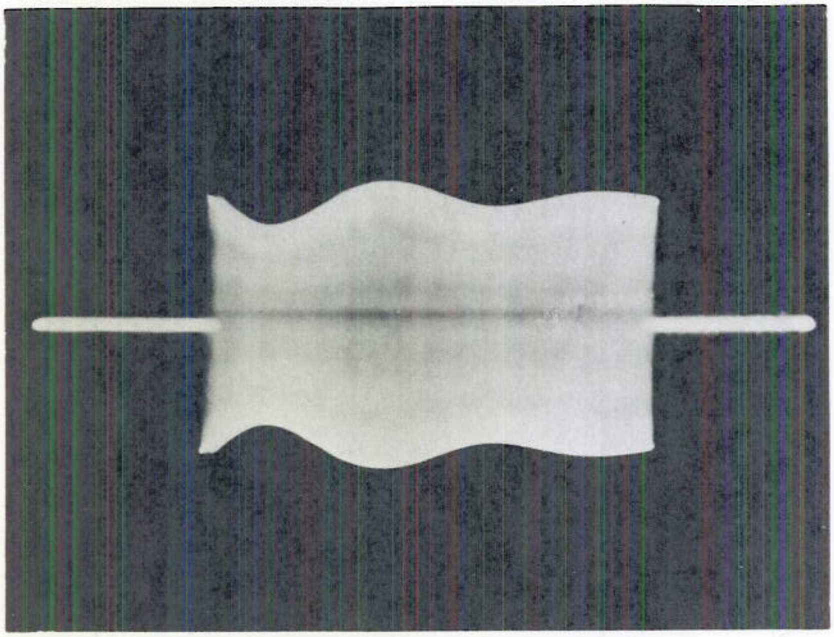
200 WATT FINAL R.S. 383

PLATE 36

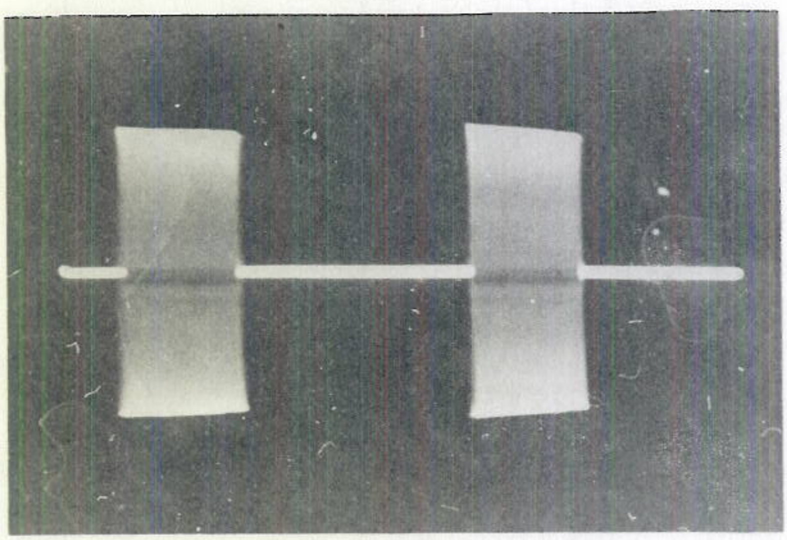
2nd I.P.A. AND LIMITER TUBE 12P50A



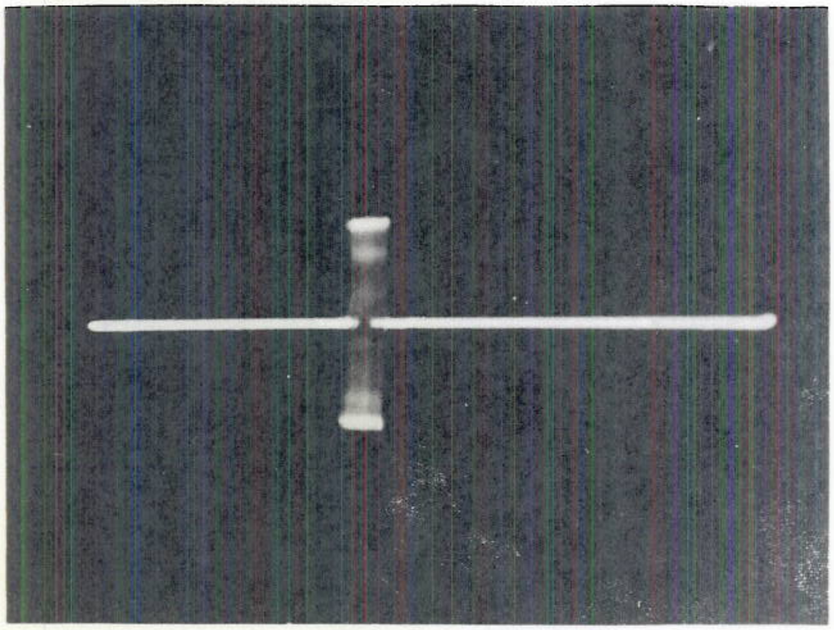
1st I.P.A. AND OSCILLATOR TUBE REN 904



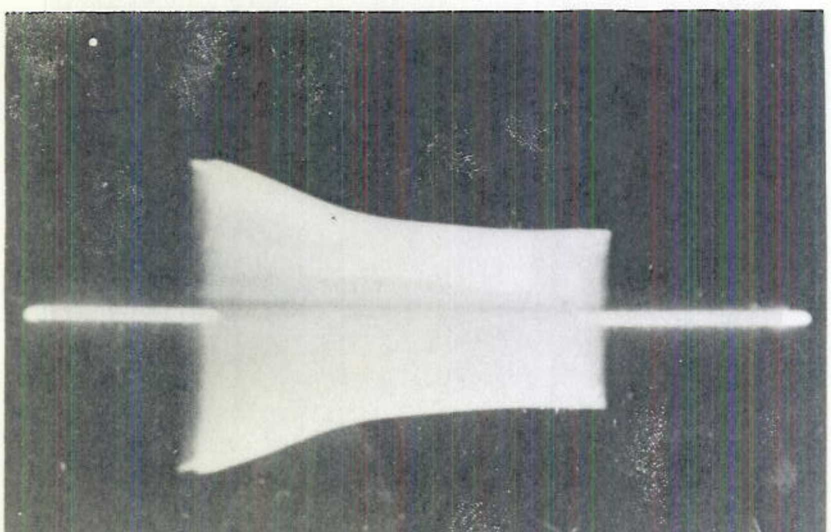
XMTR BEING KEYED BY A BOEHME AUTOMATIC KEYER USING ONE CONTACT AT 20 WORDS PER MINUTE. THE OSCILLOSCOPE IS CONNECTED TO THE FINAL.



XMTR BEING KEYED BY A BOEHME AUTOMATIC KEYER USING ONE CONTACT AT 325 WORDS PER MINUTE. THE OSCILLOSCOPE WAS CONNECTED TO THE FINAL. THE TYPE OF DUMMY LOAD DOES NOT EFFECT THE SHAPE OF THE FIGURE IN ANY OF THESE CONDITIONS

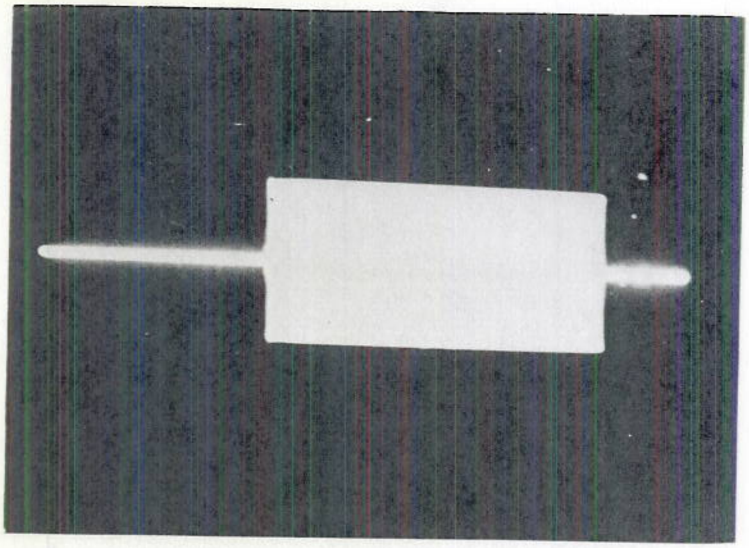


XMTR BEING KEYED BY A BOEHME AUTOMATIC KEYER USING ONE CONTACT AT 425 WORDS PER MINUTE. THE OSCILLOSCOPE WAS CONNECTED TO THE FINAL.

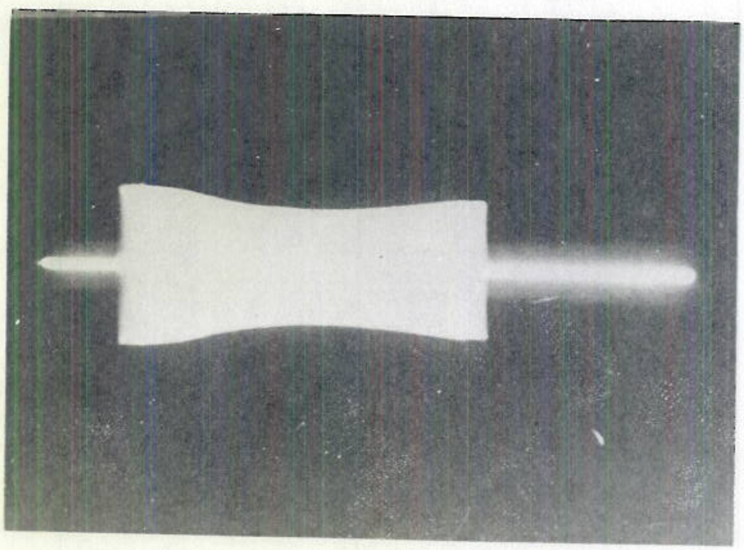


XMTR BEING KEYED BY A BOEHME AUTOMATIC KEYER USING ONE CONTACT 50 WORDS PER MINUTE. THE OSCILLOSCOPE WAS CONNECTED TO THE FINAL.

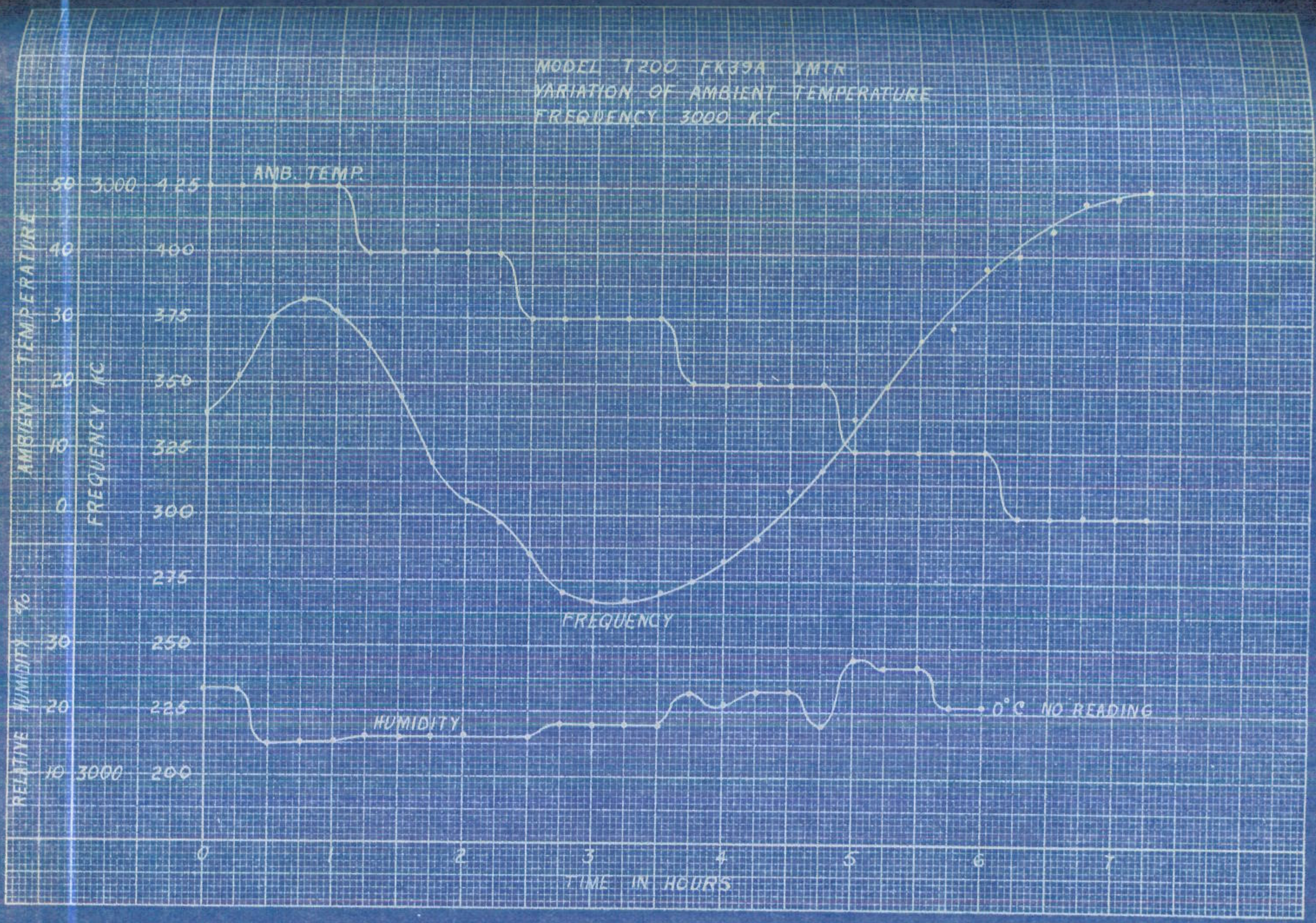
PLATE 40

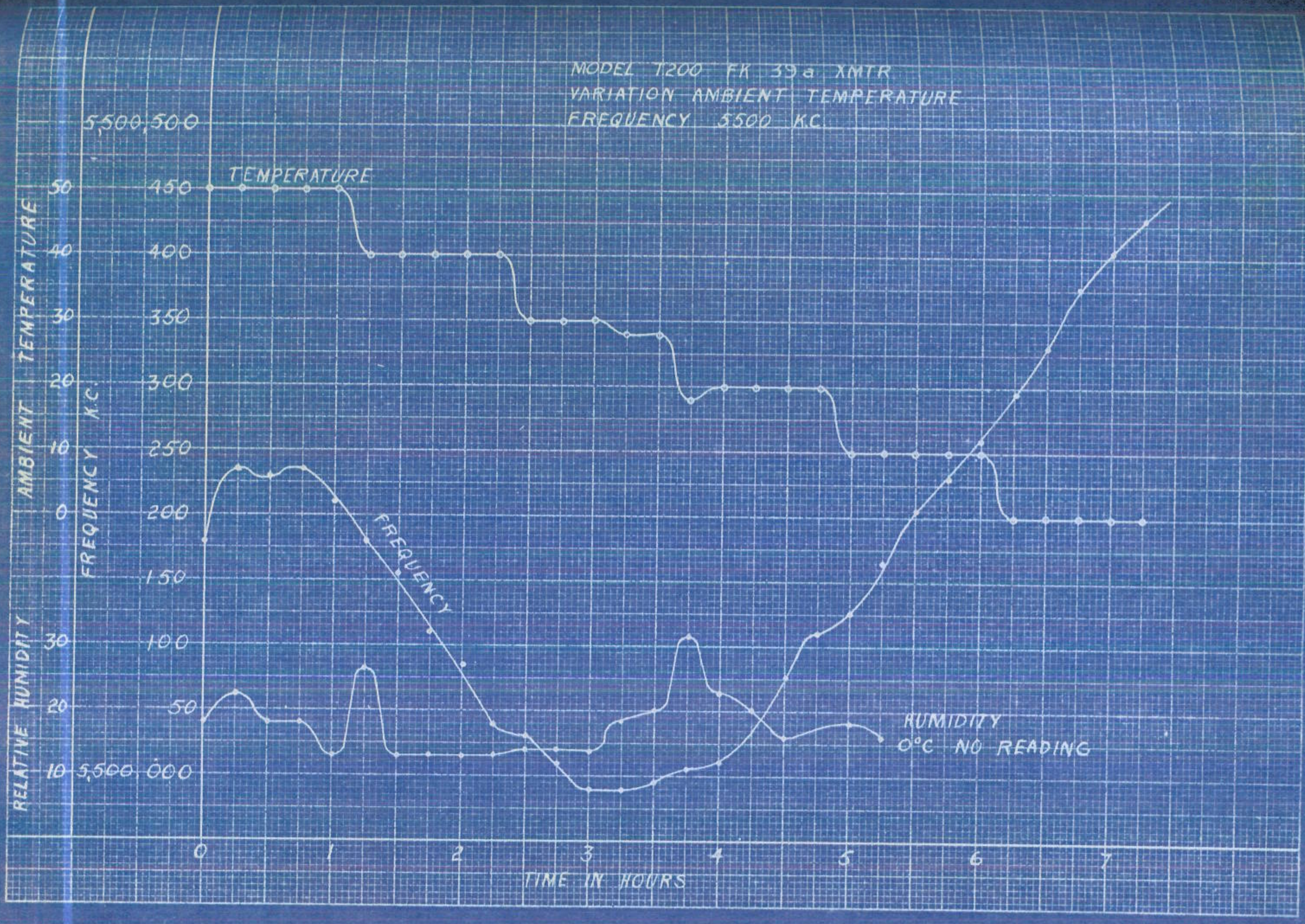


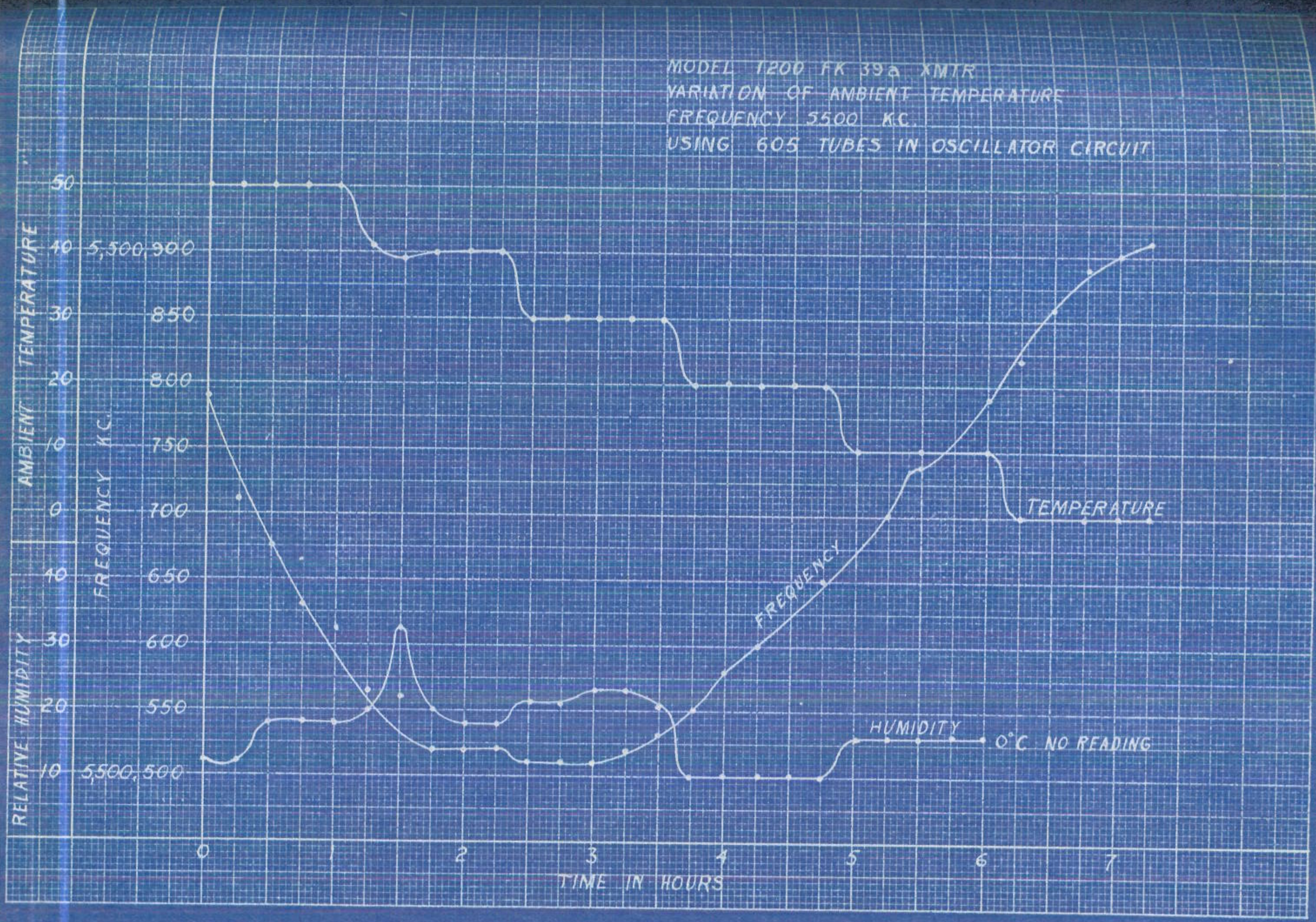
XMTR BEING KEYED BY A BOEHME AUTOMATIC KEYER USING ONE CONTACT AT 50 WORDS PER MINUTE. THE OSCILLOSCOPE WAS CONNECTED TO THE OSCILLATOR. THE OSCILLATOR WAS NOT ENERGIZING THE REST OF THE CIRCUIT.



XMTR BEING KEYED BY A BOEHME AUTOMATIC KEYER USING ONE CONTACT 20 WORDS PER MINUTE. THE OSCILLOSCOPE WAS CONNECTED TO THE OSCILLATOR DURING NORMAL OPERATION. THE FREQUENCY DOES NOT EFFECT THE SHAPE OF THE FIGURE.

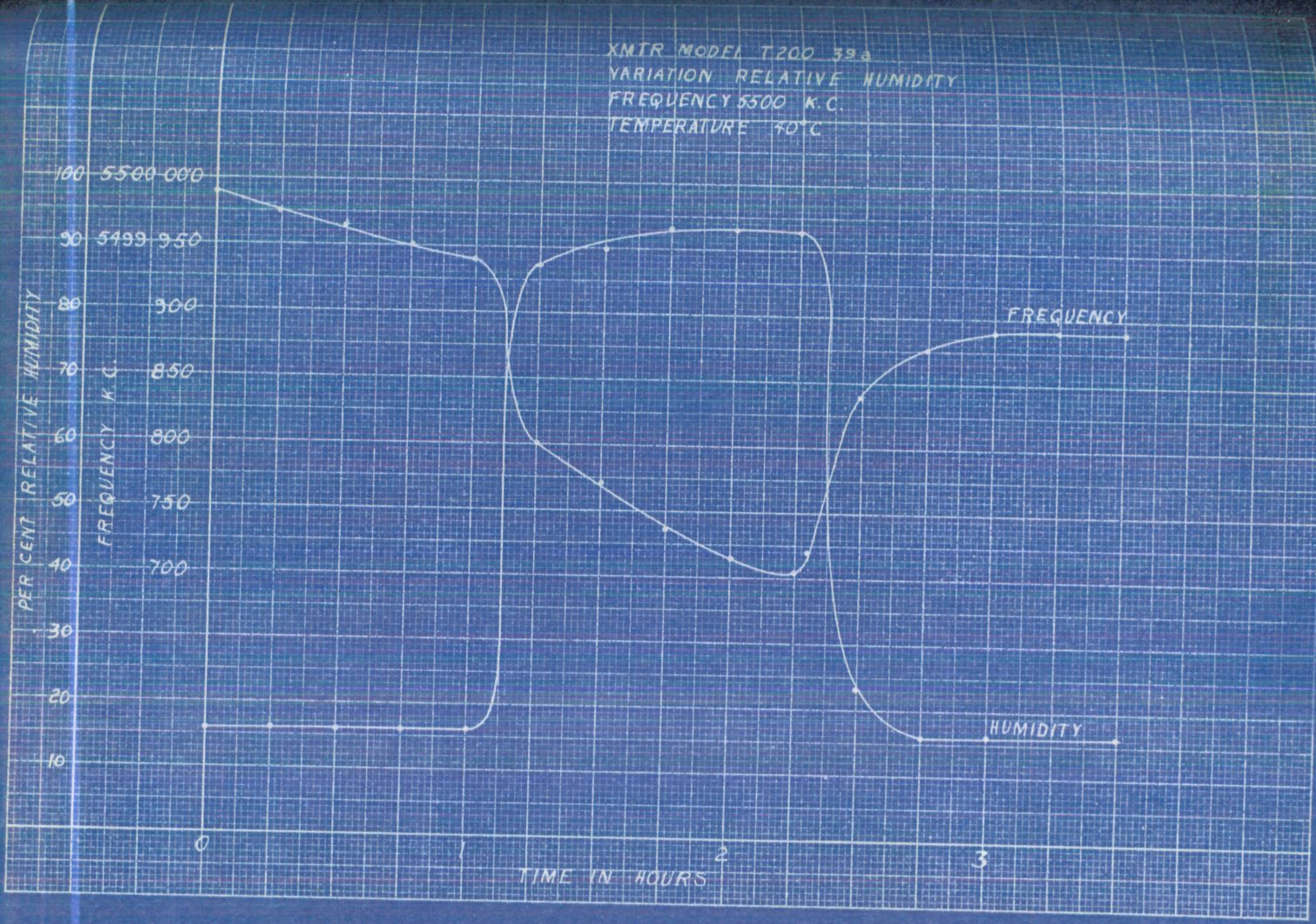

MODEL T200 FK39A XMTR
VARIATION OF AMBIENT TEMPERATURE
FREQUENCY 3000 K.C.
AMB. TEMP.
FREQUENCY
HUMIDITY
0°C NO READING
AMBIENT TEMPERATURE
FREQUENCY KC
RELATIVE HUMIDITY %
50 3000 425
40 400
30 375
20 350
10 325
0 300
275
30 250
20 225
10 3000 200
0 1 2 3 4 5 6 7
TIME IN HOURS


MODEL T200 FK 39a XMTR
VARIATION AMBIENT TEMPERATURE
FREQUENCY 5500 K.C.
TEMPERATURE
FREQUENCY
HUMIDITY
0°C NO READING
TIME IN HOURS
AMBIENT TEMPERATURE
FREQUENCY K.C.
RELATIVE HUMIDITY
5,500,500
450
400
350
300
250
200
150
100
50
5,500,000
50
40
30
20
10
0
30
20
10
0
1
2
3
4
5
6
7



R-2911

Plate 44


XMTR MODEL T200 39a
VARIATION RELATIVE HUMIDITY
FREQUENCY 5500 K.C.
TEMPERATURE 40°C
PER CENT RELATIVE HUMIDITY
FREQUENCY K.C.
100
90
80
70
60
50
40
30
20
10
5500 000
5499 950
900
850
800
750
700
FREQUENCY
HUMIDITY
0
1
2
3
TIME IN HOURS

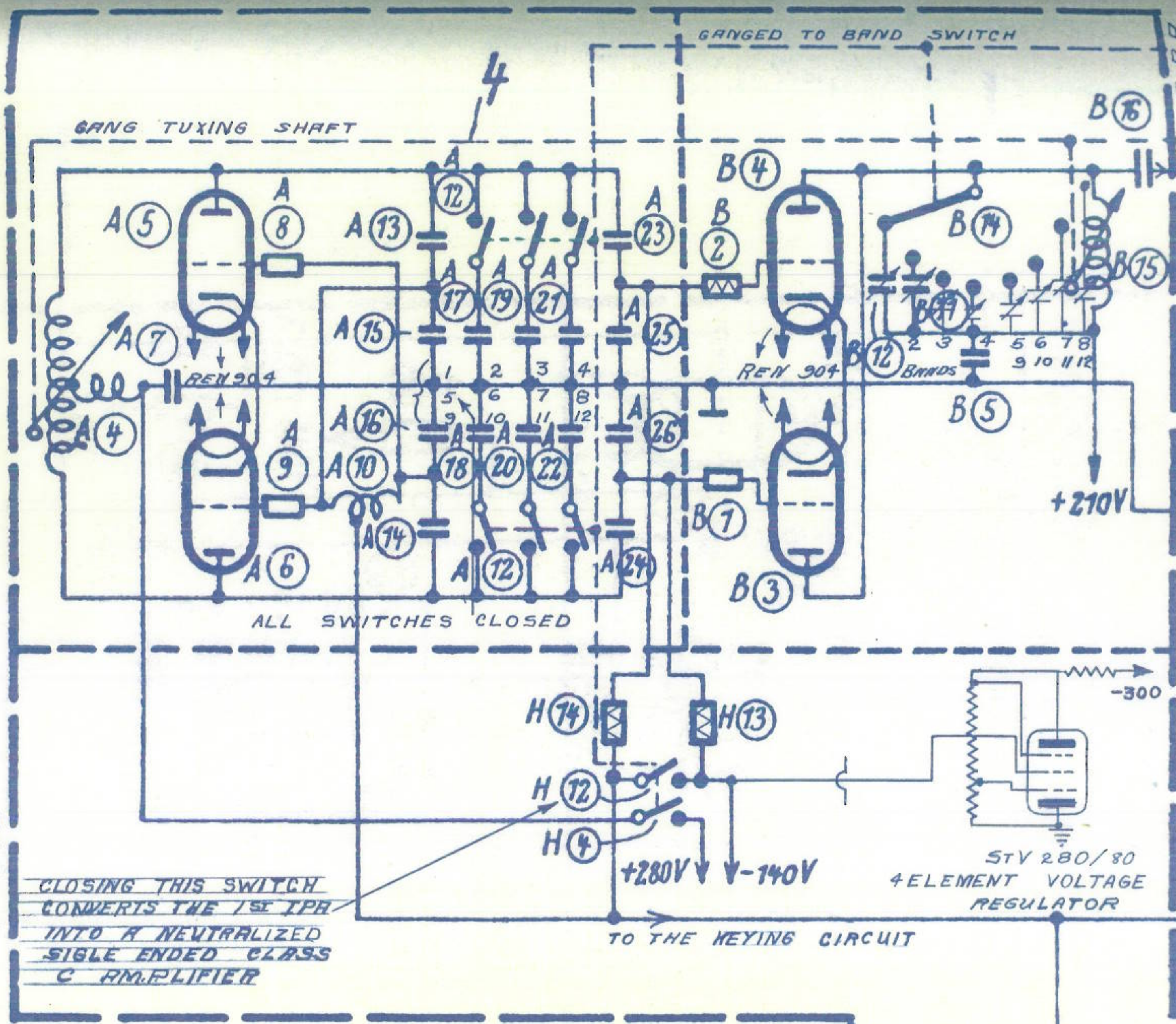
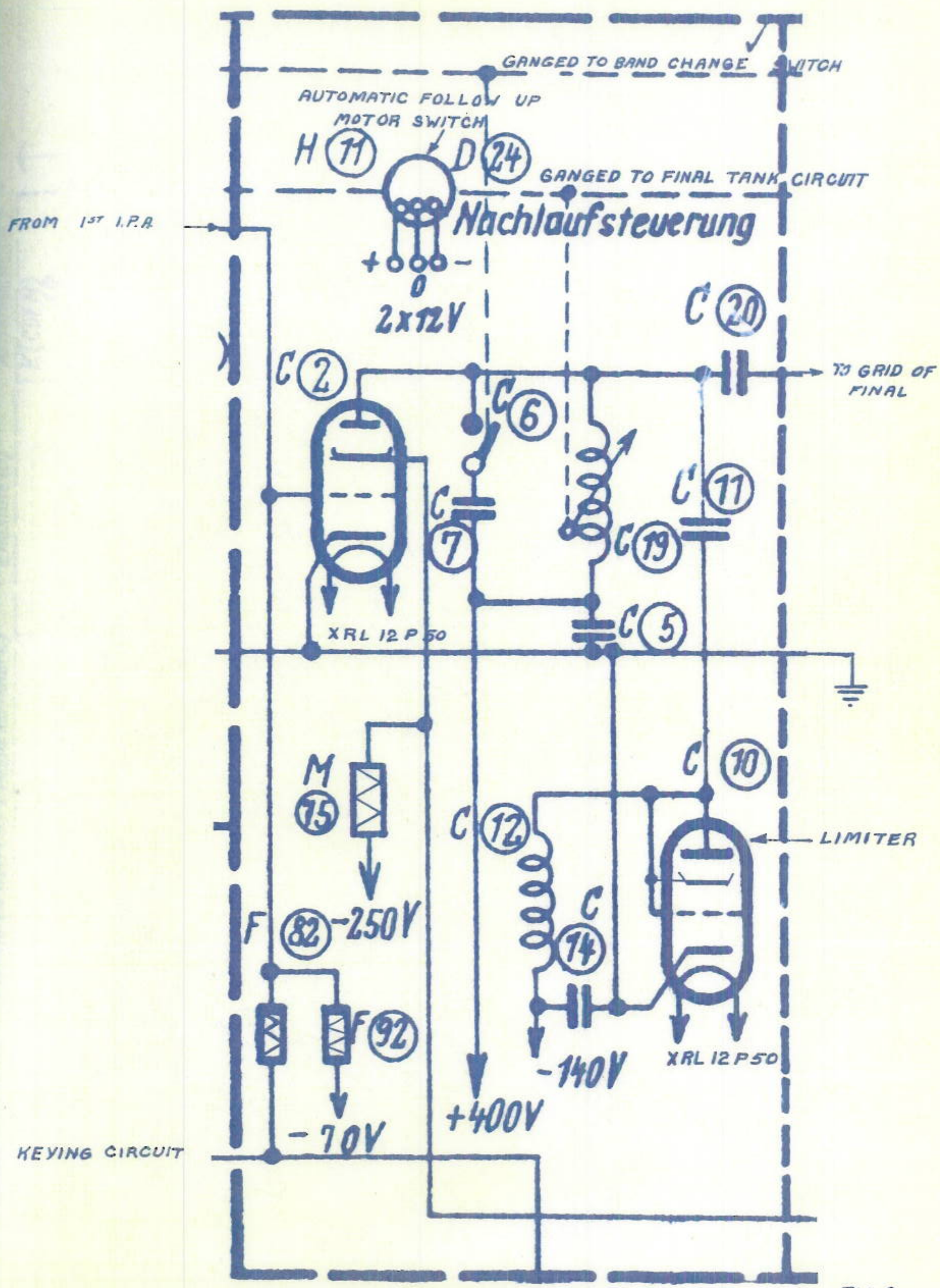


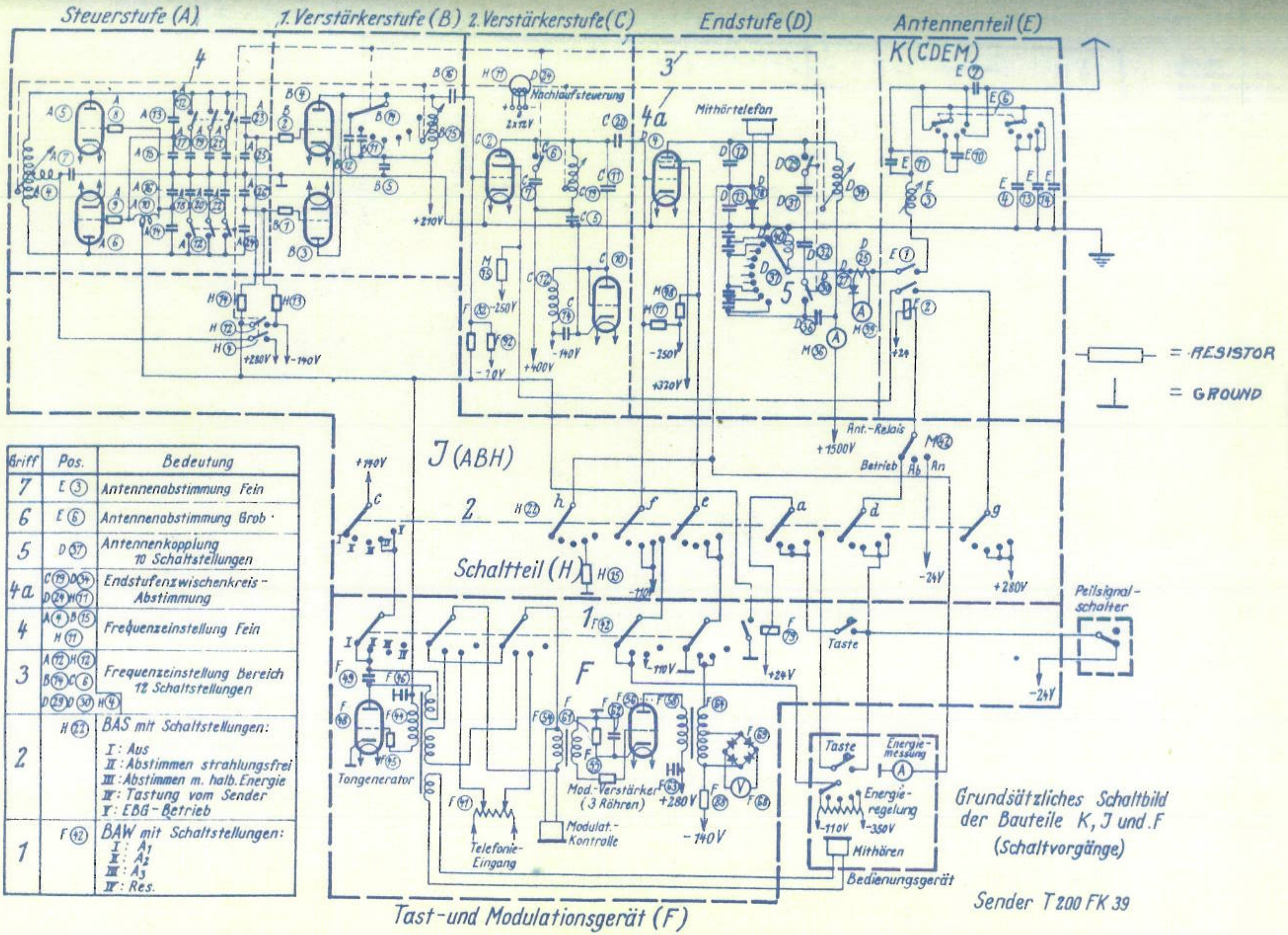
FIG. 1

SCHEMATIC OF OSCILLATOR & 1ST I.P.A.



SCHEMATIC OF 2ND I.P.A AND LIMITER

FIG.2



Griff	Pos.	Bedeutung
7	E ③	Antennenabstimmung Fein
6	E ⑥	Antennenabstimmung Grob
5	D 37	Antennenkopplung 10 Schaltstellungen
4a	C 19 D 34 D 24 H 11	Endstufenzwischenkreis-Abstimmung
4	A ④ B 15 H 11	Frequenzeinstellung Fein
3	A 12 H 12 B 14 C ⑥ D 29 D 30 H ④	Frequenzeinstellung Bereich 12 Schaltstellungen
2	H 22	BAS mit Schaltstellungen: I: Aus II: Abstimmen strahlungsfrei III: Abstimmen m. halb. Energie IV: Tastung vom Sender V: EBG-Betrieb
1	F 42	BAW mit Schaltstellungen: I: A_1 II: A_2 III: A_3 IV: Res.

Grundsätzliches Schaltbild der Bauteile K, J und F (Schaltvorgänge)

Sender T 200 FK 39

FIG. 3

Tast-und Modulationsgerät (F)

SIMPLIFIED SCHEMATIC

VII/L 627a

Anlage d

Achtung.

Verdrahtung nach L-Stückliste

Potential-Bezeichnung

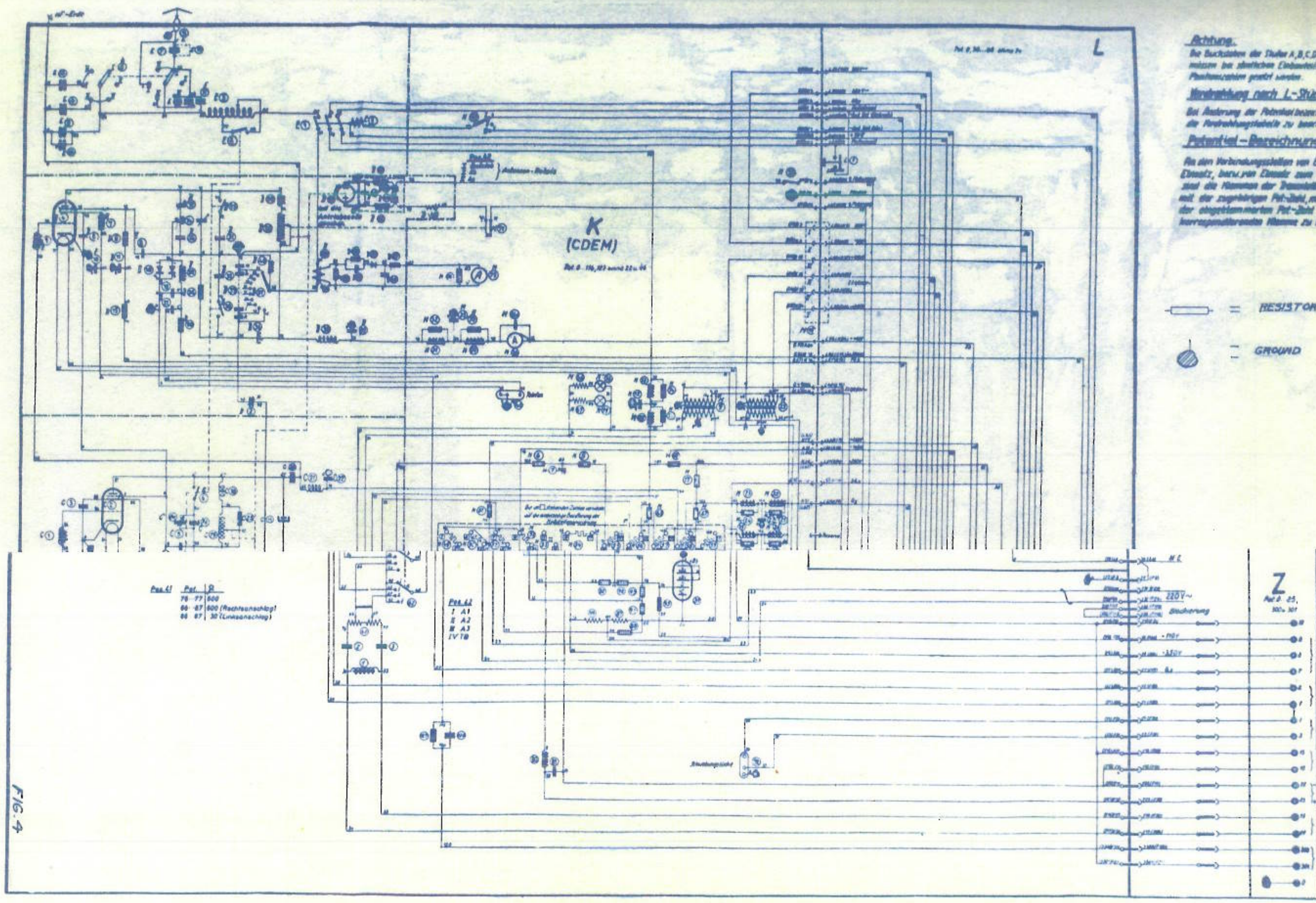


FIG. 4

L12339 COMPLETE - SCHEMATIC

Senderschaltbild T200 FK39a

Anlage f